University of Waterloo
Undergraduate Calendar
1975-1976
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. The office is not open Saturday.

Federated and Affiliated Church Colleges, Telephones
Conrad Grebel College, (519) 885-0220
Renison College, (519) 884-4400
University of St. Jerome's College, (519) 884-8110
St. Paul's College, (519) 885-1460

The Senate and Board of Governors of the University of Waterloo reserve the right to invoke changes in this Calendar without prior notice.
University of Waterloo
Undergraduate Calendar
1975-76

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**Academic Calendar**

**1975**

**March 3, Monday**
Meeting – Senate Executive Committee

**March 10, Monday**
Supplemental Examinations Begin – Co-operative Programmes

**March 10, Monday**
Pre-registration Begins – Regular and Co-operative Students for Fall Term 1975

**March 14, Friday**
Pre-registration Ends – Regular and Co-operative Students for Fall Term 1975

**March 17, Monday**
Meeting – University Senate

**March 28, Friday**
Good Friday – University Closed

**April 1, Tuesday**
Meeting – Board of Governors

**April 2, Wednesday**
Lectures End – Winter Term

**April 5, Saturday**
Examinations Begin – Winter Term

**April 7, Monday**
Meeting – Senate Executive Committee

**April 21, Monday**
Meeting – University Senate

**April 25, Friday**
Spring Work Term Begins – Co-operative Programmes

**April 28, Monday**
Spring Work Term Ends – Co-operative Programmes

**April 29, Tuesday**
Registration – Undergraduate Co-operative Programmes

**April 30, Wednesday**
Registration – Graduate Studies – Spring Term

**May 5, Monday**
Meeting – Senate Executive Committee

**May 19, Monday**
Victoria Day – University Closed

**May 20, Tuesday**
Meeting – University Senate

**May 21, Wednesday**
End of Course Change Period – Spring Term

**May 22, Thursday**
Spring Convocation

**May 23, Friday**
Spring Convocation

**May 24, Saturday**
Spring Convocation

**May 26, Monday**
Pre-registration Begins – Co-operative Students for Winter Term 1976

**May 28, Wednesday**
Pre-registration Ends – Co-operative Students for Winter Term 1976

**June 2, Monday**
Meeting – Senate Executive Committee

**June 3, Tuesday**
Meeting – Board of Governors

**June 16, Monday**
Meeting – University Senate

**June 30, Monday**
University Closed

**July 1, Tuesday**
 Dominion Day – University Closed

**July 2, Wednesday**
Registration – Summer Session

**July 4, Friday**
End First Half Course Change Period – Summer Session

**July 14, Monday**
Supplemental Examinations Begin

**July 25, Friday**
End Second Half Course Change Period – Summer Session

**July 30, Wednesday**
Lectures End – Spring Term

**August 2, Saturday**
Examinations Begin – Spring Term

**August 4, Monday**
Civic Holiday – University Closed

**August 8, Friday**
Examinations End – Spring Term

**August 12, Tuesday**
Lectures End – Summer Session

**August 13, Wednesday**
Examinations Begin – Summer Session

**August 14, Thursday**
Examinations End – Summer Session

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

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

**September 1, Monday**
Labour Day – University Closed

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

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

**September 5, Friday**
Registration – Graduate Studies – Fall Term
September 5, Friday
Registration Ends - Undergraduate Regular and 
Co-operative Programmes
September 8, Monday
Lectures Begin – Fall Term
September 15, Monday
Meeting – University Senate
September 26, Friday
End of Course Change Period – Fall Term
October 6 Monday
Meeting – Senate Executive Committee
October 7, Tuesday
Meeting – Board of Governors
October 13, Monday
Thanksgiving Day – University Closed
October 20, Monday
Meeting – University Senate
October 24, Friday
Lectures Begin – Fall Term
October 26, Monday
Meeting – University Senate
November 3, Monday
Supplemental Examinations Begin – Co-operative 
Programmes
November 3, Monday
Meeting – Senate Executive Committee
November 5, Wednesday
Pre-registration Begins – On-Campus Co-operative 
Students for Spring Term 1976
November 7, Friday
Pre-registration Ends – On-Campus Co-operative 
Students for Spring Term 1976
November 17, Monday
Meeting – University Senate
December 1, Monday
Meeting – Senate Executive Committee
December 3, Wednesday
Lectures End – Fall Term
December 6, Saturday
Examinations Begin – Fall Term
December 15, Monday
Meeting – University Senate
December 19, Friday
Examinations End – Fall Term
December 24, Wednesday
University Closed
December 25, Thursday
Christmas Day – University Closed
December 26, Friday
University Closed
December 26, Friday
Fall Work Term Ends – Co-operative Programmes
December 29, Monday
Winter Work Term Begins – Co-operative Programmes

1976
January 1, Thursday
New Year's Day – University Closed
January 5, Monday
Registration – Undergraduate Co-operative 
Programmes
January 5, Monday
Registration – Graduate Studies – Winter Term
January 19, Monday
Meeting – Senate Executive Committee
January 23, Friday
End of Course Change Period – Winter Term
February 2, Monday
Meeting – Senate Executive Committee
February 3, Tuesday
Meeting – Board of Governors
February 16, Monday
Meeting – University Senate
February 16, Monday
Study Week Begins – Arts and Environmental Studies 
(Regular Programmes)
March 1, Monday
Meeting – Senate Executive Committee
March 8, Monday
Supplemental Examinations Begin – Co-operative 
Programmes
March 8, Monday
Pre-registration Begins – Regular and Co-operative 
Students for Fall Term 1976
March 12, Friday
Pre-registration Ends – Regular and Co-operative 
Students for Fall Term 1976
March 15, Monday
Meeting – University Senate
March 31, Wednesday
Lectures End – Winter Term
April 3, Saturday
Examinations Begin – Winter Term
April 5, Monday
Meeting – Senate Executive Committee
April 6, Tuesday
Meeting – Board of Governors
April 16, Friday
Good Friday – University Closed
April 19, Monday
Meeting – University Senate
April 23, Friday
Examinations End – Winter Term
April 30, Friday
Winter Work Term Ends – Co-operative Programmes
May 3, Monday
Spring Work Term Begins – Co-operative Programmes
May 3, Monday
Registration - Undergraduate Co-operative Programmes

May 3, Monday
Registration - Graduate Studies - Spring Term

May 3, Monday
Lectures Begin - Spring Term

May 3, Monday
Meeting - Senate Executive Committee

May 17, Monday
Meeting - University Senate

May 20, Thursday
Spring Convocation

May 21, Friday
Spring Convocation

May 21, Friday
End of Course Change Period - Spring Term

May 22, Saturday
Spring Convocation

May 24, Monday
Victoria Day - University Closed

May 26, Wednesday
Pre-registration Begins - Co-operative Students for Winter Term 1977

May 28, Friday
Pre-registration Ends - Co-operative Students for Winter Term 1977

June 1, Tuesday
Meeting - Board of Governors

June 7, Monday
Meeting - Senate Executive Committee

June 21, Monday
Meeting - University Senate

July 1, Thursday
Dominion Day - University Closed

July 5, Monday
Registration - Summer Session

July 5, Monday
Lectures Begin - Summer Session

July 12, Monday
Supplemental Examinations Begin

July 28, Wednesday
Lectures End - Spring Term

July 31, Saturday
Examinations Begin - Spring Term

August 2, Monday
Civic Holiday - University Closed

August 6, Friday
Examinations End - Spring Term

August 12, Thursday
Lectures End - Summer Session

August 13, Friday
Examinations Begin - Summer Session

August 14, Saturday
Examinations End - Summer Session

August 27, Friday
Spring Work Term Ends - Co-operative Programmes

August 30, Monday
Fall Work Term Begins - Co-operative Programmes
2 Admissions
3 Fees and
Registration
4 Scholarships,
Bursaries, Prizes
and Financial Aid
5 Student Services
6 Co-ordination and
Placement
7 Libraries
The University of Waterloo
The Fish Eye lens captures the Dand Porter Arts Library Building
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.

Candidates for admission and students currently enrolled in the University are encouraged to become familiar with the contents of the Calendar. If there is any doubt as to the interpretation of the contents of the Calendar, enquiries can be directed to the Registrar or to the person directly concerned with the area in question.

The Calendar is arranged in chapters which fall into four divisions. The first division contains general information about the University including services, systems of study, and library facilities. The second division outlines the undergraduate programmes offered at the University and the third division describes the courses offered in these programmes. All courses listed may not be offered in the current session, therefore, students are advised to consult the University course offerings list prior to arranging their programmes. The last division of the Calendar describes the general administrative structure of the University.

The information in this Calendar applies to the 1975-76 academic session which commences in September 1975. The Senate and the Board of Governors of the University of Waterloo reserve the right to make changes in the academic Calendar without prior notice.

The University also publishes:

- a Graduate Studies Calendar
- an Admissions Brochure
- a Summer Session Brochure
- a Part-Time Studies Handbook

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 now offered in Architecture, Arts, Engineering, Environmental Studies, Integrated Studies, Mathematics, Optometry, Human Kinetics and Leisure Studies, and Science. The University is a member of The Association of Universities and Colleges of Canada and of 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 150,000 people.

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, a stadium, extensive library facilities, two theatres, four residential Church Colleges, and a variety of modern residential accommodation.

University Colours and Coat of Arms

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

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

Motto
Concordia Cum Veritate – In Harmony with Truth

The University Mace

The symbolic theme may be described as follows:

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

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

The four-fold diversity is significant because of the four faculties existing at the time the Mace was presented to the University and as well, of the four church-related colleges federated and affiliated with the University. These diverse elements together form a crown, and the points of the crown, while tending toward a union do not quite touch but remain as individuals suspended in tension and yet engaged in a deep harmony. This creative process is 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 all society at large, must expect to be 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. Qualified students, registered in any faculty in the University, may choose electives from among the multi-disciplinary courses offered by Inter-Faculty Studies.

Enrollment for each Faculty - 1974-75 (as of October, 1974)

| Faculty of Arts | 2650 |
| Faculty of Engineering | 2,803 |
| Faculty of Environmental Studies | 1,176 |
| Faculty of Human Kinetics and Leisure Studies | 1,078 |
| Integrated Studies Programme | 74 |
| Faculty of Mathematics | 2,658 |
| Faculty of Science | 1,186 |

Total Undergraduate Enrollment (Full-Time) | 12,244 |
Graduate Student Enrollment (Full-Time) | 1,186 |

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 since 1947 and entered 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 and certain programmes in the Faculty of Environmental Studies. Students registered at St. Jerome's College freely supplement their programmes with courses offered at the University and students registered at the University complement their programmes with courses offered uniquely at St. Jerome's. In the Calendar, St. Jerome's faculty members and courses are indicated by a J suffix. Graduates of the college receive University of Waterloo degrees in accordance with the terms of the federation agreement.

A continuous building programme since 1962 finds St. Jerome's presently with a teaching and administration building, a library, a men's residence accommodating 120 and a women's residence, Notre Dame College, operated by the School Sisters of Notre Dame, which has room for 120 students. The University of St. Jerome's College is conducted by the Congregation of the Resurrection.

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

Academic offerings at Renison include courses in two areas:

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

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

The college has two residences accommodating 100 men and 80 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.

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

Information regarding admission to the Church Colleges residences can be found under “Residences” in Chapter 5 of this calendar.

Degrees Offered

The University of Waterloo offers the following undergraduate degrees:

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

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

The University of Waterloo offers the following graduate degrees:

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

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

Honorary Degrees

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

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

Systems of Study

The University offers its students two different systems of study, the Regular System and the Co-operative System. Some programmes are offered under one system only, while others are offered under either system. Each of the programme sections in this Calendar contains information concerning the System of Study that can be followed for the programme described.

Regular System

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

Co-operative System

Students studying under the Co-operative System spend alternating terms of four months duration on the campus for academic studies, and with business, industry, or government for off-campus practical training. The standard Co-operative Programme consists of eight four-month terms of study and six four-month terms of employment. Some programmes vary from this standard arrangement. The necessary arrangements for the work terms are handled by the Co-ordination Department. Further information about the Co-operative System can be found in the section of this Calendar that deals with the Co-ordination Department.

Part-time Studies

Opportunities for part-time studies are available primarily through the Faculty of Arts, and to a limited extent through the other faculties. Students wishing to pursue studies on a part-time basis may enrol in regularly scheduled day courses as well as evening or Saturday classes. Although courses given in the evenings and Saturdays have been arranged for the convenience of part-time students, some may find it more convenient to attend classes during regular school hours. The University offers a six week summer programme under the Faculty of Arts as well as courses under a correspondence format.

There is no distinction between part-time and full-time students as to admission requirements, grading practices, or promotion policies.

Information regarding the availability of courses and assistance regarding admission and registration
procedures can be obtained from the Office of Part-time Studies, Needles Hall.

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

The Correspondence Programme was originally designed to assist elementary and secondary school teachers in upgrading their teaching qualifications. However, the courses may be taken by anyone with a suitable academic background and can be used for credit towards a degree at the University of Waterloo. Degree programmes in Arts, Mathematics and Science may be taken entirely on a part-time basis by any combination of correspondence, regular or summer courses which will fulfill the degree requirements of the faculty. Further information can be obtained from:
The Director,
Correspondence Programme,
University of Waterloo,
Waterloo, Ontario N2L 3G1

Grading System
The University uses a grading system whereby 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 100-point scale. Each Faculty chooses to display the grades obtained in each course by grades or numeric marks. All Departments within the Faculty then use the system chosen.

Please refer to the individual Faculty sections for a complete breakdown of the appropriate grading system.

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<td>B+</td>
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<td>B</td>
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<td>80-100</td>
<td>First Class Honours</td>
<td>Excellent</td>
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<td>70-79.99</td>
<td>Second Class Honours</td>
<td>Very Good</td>
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<tr>
<td>60-69.99</td>
<td>Third Class Honours</td>
<td>Good</td>
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<td>50-59.99</td>
<td>Passing</td>
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<td>0-49</td>
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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 Decision pending, no credit granted

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. 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.

Continuing Education
Through a number of channels the University recognizes its responsibility for the continuing education of adults.
A brochure outlining the many credit courses offered by correspondence, or on the campus, at times convenient to members of the outside community, is available from the Office of the Registrar.
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 Information Services Department.
Through its Bookings Office the University makes its facilities available at reasonable cost to those organizations or groups who desire to conduct educational functions on the campus. Many such conferences, symposia, and workshops are held on the campus each year.

The activities of the Centre for Continuing Management Education are outlined below.

Centre for Continuing Management Education

The Centre for Continuing Management Education offers short courses, seminars, and workshops for the business community in both marketing and management. They are designed to help managers do a better job in their current assignments, to better prepare them for the job ahead and to give them new perspectives, through exposure to their peers, in a wide range of business, industry, and government service.

In addition, the Centre’s staff assists in the preparation of management development programmes to meet the particular needs of an organization.

No degree courses are offered by the Centre and no courses involve degree credits.

The programme has grown from the original Advanced Course in Marketing and Sales Management in 1962 to more than eighty offerings in 1975 in the areas of Marketing and Management Techniques.

The Centre is also responsible for the administration of the Canadian Institute of Management programme and the Certified General Accountants programme.

These are four and five year courses respectively leading to recognition by these Associations.

Further information can be obtained from the Centre for Continuing Management Education, University of Waterloo.

The Computing Centre

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

Faculty, staff, and students who use the batch-computing services soon become familiar with what is known as the DEBUG Service. This service is accessed via DEBUG Terminals which consist of high-speed card readers and printers set up to service a cafeteria-style lineup of computer users. This concept was developed at the University of Waterloo to provide simple and fast access to the computer as both an educational and a computational device for students throughout the University. A wide variety of programming languages and applications packages are available through the DEBUG Service. This cafeteria-style concept enables a great many programmes to be run with minimal waiting periods for output; it is a concept which has been adopted by many universities to quickly process the large volume of programmes submitted by both graduate and undergraduate students as part of academic course assignments.

On the DEBUG Service, in order to ensure a rapid-throughput environment, each processor is limited to a small amount of computing time and a small number of pages of printed output. While these limits are sufficient for introductory-level computing, they are not usually sufficient for the completion of research-oriented computing projects. Such work must eventually be submitted to the more general BATCH Service, where job turnaround is a function of resource requirements, or performed using the general time-sharing facilities provided by VM/370 CMS. With CMS, it is possible to develop and/or execute programmes and applications packages in an interactive manner; because of the “virtual memory” capabilities of VM/370, it is also possible to convert large-memory-requirement programmes to CMS (since all of the commonly-used language processors and applications packages are available through CMS) to take advantage of the increased “human productivity” that a time-sharing facility provides.

In addition to operating the computing equipment and maintaining the computing software, the Computing Centre provides many “user services.” Programming consultation, non-credit courses and seminars, documentation, computer reference room facilities, and newsletters are provided by the user services personnel of the Centre to help make using the computer an easier and more efficient process for all members of the university community.
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 applications forms; to forward applications and proposals to appropriate agencies; to act as a centre of communications between granting agencies and faculty; and to assist faculty in obtaining grants and contracts for undertaking research.

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

Contract Research: With its responsibility for contract research the Office of Research Administration has absorbed the Waterloo Research Institute, formerly the Industrial Research Institute established in 1967. 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 Co-ordinator is also responsible for obtaining school age children as subjects for suitable university research projects.

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

General Admission 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, (faculty desired) University of Waterloo, Waterloo, Ontario. N2L 3G1

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 1975.

St. Jerome's College
Applicants may apply for programmes in Arts, Environmental Studies (Geography and Man Environment Studies), and Mathematics (regular programme only) through St. Jerome's College. All applicants should indicate clearly "St. Jerome's College" on their application form.
Inquiries and correspondence should be directed to: The Registrar, St. Jerome's College, University of Waterloo, Waterloo, Ontario. N2L 3G2

Renison College
Applicants may apply for programmes in Arts through Renison College as well as through the University. Renison College applicants should indicate "Renison College" clearly on the application form.

Inquiries and correspondence regarding admissions should be directed to:
The Registrar, Renison College, University of Waterloo, Waterloo, Ontario. N2L 3G2

General Requirements
For all programmes, the University normally requires that the prerequisites for the Ontario Secondary School Honour Graduation Diploma be satisfied and that a minimum average of 60% be obtained. Applicants educated outside of Ontario must submit evidence of having obtained a level of education equivalent to Ontario Year 5 (see page 23) as well as meeting the subject prerequisites and satisfying any special average requirements.

Limited Enrolment
In some programmes the number of qualified applicants may exceed the number of places available. The possession of the minimum requirements does not in itself guarantee admission to any of the programmes.

Applicants – Ontario Year 5 (Grade 13)
Specific Faculty/Programme Recommendations and Requirements
Where courses are recommended to be included in the applicant's background, it means that it would be beneficial to the applicant in his first year of study at the University to have these courses in his background. These are recommendations only, it does not mean that the applicant's admission decision will be jeopardized if the recommended courses are not taken. Please refer to the chart on the following page.
<table>
<thead>
<tr>
<th>Faculty</th>
<th>Specific Year 5 Requirements</th>
<th>Special Averages</th>
<th>Recommendations and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>Relations and Functions</td>
<td>60% overall average in specific requirements.</td>
<td>It is recommended that applicants select Arts related courses in their Year 5 programme such as English, History, languages (other than English) etc.</td>
</tr>
<tr>
<td>Engineering</td>
<td>Relations and Functions</td>
<td>60% overall average in specific requirements.</td>
<td>Applicants who do not have the specific Year 5 requirements but who have a high overall standing including at least Relations and Functions and Calculus are also encouraged to apply for admission.</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>Relations and Functions</td>
<td>Normally a 60% overall average is required in these courses</td>
<td>Because of the increasing use of statistics and quantitative methods in environmental research, it is recommended, but not required, that students present at least one Year 5 Mathematics course for admission to all programmes in Environmental Studies.</td>
</tr>
<tr>
<td>Architecture (pre-professional programme)</td>
<td>Relations and Functions</td>
<td></td>
<td>Selected applicants may be required to come to the University for an interview.</td>
</tr>
<tr>
<td>Geography</td>
<td>Relations and Functions</td>
<td></td>
<td>It is recommended that applicants to the Geography programme include Geography in their Year 5 programme.</td>
</tr>
<tr>
<td>Man Environment Studies</td>
<td>Relations and Functions</td>
<td></td>
<td>Because of the increasing use of statistics and quantitative methods in environmental research, it is recommended but not required that students present at least one Year 5 Mathematics course for admission to programmes in Environmental Studies.</td>
</tr>
<tr>
<td>Urban and Regional Planning</td>
<td>Relations and Functions</td>
<td></td>
<td>Selected applicants may be required to come to the University for an interview.</td>
</tr>
<tr>
<td>Human Kinetics and Leisure Studies</td>
<td>Relations and Functions</td>
<td></td>
<td>It is recommended that applicants select a Year 5 programme that includes one or more of the following courses: Calculus, Biology, Chemistry, Physics.</td>
</tr>
<tr>
<td>Kinesiology</td>
<td>Relations and Functions</td>
<td></td>
<td>It is recommended that applicants include both Biology and Geography in their Year 5 programme.</td>
</tr>
<tr>
<td>Recreation</td>
<td>Relations and Functions</td>
<td></td>
<td>Each applicant to Integrated Studies is considered on the basis of a personal interview with a committee composed of students, resource persons and staff. Those who show an aptitude for self-direction and independent study and the ability to flourish in an unstructured academic setting will be given strongest consideration.</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Relations and Functions</td>
<td>The Regular Programme requires a 60% overall average in specific requirements. The Co-operative Programme requires a 66% overall average in specific requirements.</td>
<td>It is recommended that applicants include both Chemistry and Physics in their Year 5 programme.</td>
</tr>
<tr>
<td>Science</td>
<td>Relations and Functions</td>
<td>60% overall average in specific requirements.</td>
<td>It is recommended that applicants include both Chemistry and Physics in their Year 5 programme.</td>
</tr>
</tbody>
</table>
Applicants who are not currently registered in Ontario Year 5 are considered under the following broad categories. These categories serve to identify general areas of academic preparation.

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

Applicants are advised to contact the Assistant Registrar of the desired faculty to discuss admissibility and appropriate qualifying work. Generally, it is recommended that applicants who are applying to enter the University as adult students, attempt to obtain standing in at least one Ontario Year 5 level subject or its equivalent. This preparation should relate to the programme the applicant wishes to study at the University.

Mature students who cannot meet the requirements for degree candidacy, or who are uninterested in pursuing a degree at this time, may apply on a non-degree basis. Such students may take as many as two courses per session for university credit, up to a total of six. Courses taken under this provision will count toward a degree if the student is admitted later as a degree candidate.

Each application will be considered on its own merit by the Admissions Committee.

**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 asked to provide additional information such as course descriptions, etc., in addition to their official academic transcript. The provision of such information will greatly facilitate the evaluation of previous work and the consideration of possible transfer credits.

**Transfer Credit**
Transfer credit will depend upon the programme applied to, the relevancy of the previous programme studied, and approval from the appropriate department that such courses are to be credited to the student's programme.

As the specific transfer credit policies vary with each faculty, students are advised to refer to the faculty sections in the calendar for detailed regulations.

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

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

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

**Certificates Equivalent to the Ontario Secondary School Honour Graduation Diploma**
All applicants are required to hold the specific subject requirements indicated on page 22 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 and grades received.

**A) Applicants from Other Canadian Provinces**
- Alberta Senior Matriculation (Grade 12)
- British Columbia Senior Matriculation (Grade 12)
- Manitoba Senior Matriculation (Grade 12)
- New Brunswick Year 1 Memorial University
- Newfoundland Year 1 Memorial University
- Nova Scotia Senior Matriculation (Grade 12)
- Prince Edward Island Year 1 University of P.E.I.
- Quebec First Year CEGEP programme or equivalent
- Saskatchewan Senior Matriculation (Grade 12)

**B) Applicants from Other Countries**

**United Kingdom and Commonwealth**
- United States of America Secondary School Graduation plus an additional year of formal study in subjects comparable to Ontario Year 5.
- Hong Kong Hong Kong Matriculation

(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.

<table>
<thead>
<tr>
<th>Country</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>B.A. or B.A.Sc. (first or second division)</td>
</tr>
<tr>
<td>Europe</td>
<td>Maturity or Matriculation Certificate</td>
</tr>
<tr>
<td>Central and South America</td>
<td>First year University with a standing of at least (B-)</td>
</tr>
<tr>
<td>Countries Using French Educational System</td>
<td>Baccalaureate Passable</td>
</tr>
</tbody>
</table>

Candidates from other countries holding other certificates 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.

**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 enable him to pursue his 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 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 to a First-Year Full-Time programme must submit their applications through the Ontario University Application Centre (OUAC):

   - a) Applicants presently enrolled in an Ontario Secondary School must complete OUAC form 101 available from the secondary school guidance departments.
   - or
   - b) Applicants not enrolled in an Ontario Secondary School (e.g. mature applicants, applicants from outside Ontario) must complete OUAC form 105. These forms may be obtained from the Registrar's Office.

2) Applicants requesting an advanced level, or part-time or correspondence courses should contact the University for the appropriate application forms. Do Not apply through the Application Centre.

**Note**

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

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

3) **Application Dates**

Because of the number of applications received each year, the University has established certain dates after which it cannot guarantee consideration of any application that is received.

<table>
<thead>
<tr>
<th>Session/Term starting</th>
<th>Last date for application</th>
</tr>
</thead>
<tbody>
<tr>
<td>May, 1975</td>
<td>March 1, 1975</td>
</tr>
<tr>
<td>July, 1975</td>
<td>June 1, 1975</td>
</tr>
<tr>
<td>September, 1975</td>
<td>July 1, 1975</td>
</tr>
<tr>
<td>January, 1976</td>
<td>November 1, 1975</td>
</tr>
</tbody>
</table>

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

**Processing of an Application**

In order to complete the processing of an application to the University of Waterloo, it is mandatory that all required documents (i.e. transcripts, letters of reference, etc.) plus an application for undergraduate admission, are on file in the appropriate faculty area in the Office of the Registrar. The application will then be presented to the Admissions Committee.
Admissions
Registration and Fees

a) The following criteria is used in selecting Year 5 applicants for admission:
Year 5 interim standing
Year 4 final standing
Principal's recommendation.

The overall university requirement will be assurance from the applicant's Secondary School that the prerequisites for the Secondary School Honour Graduation Diploma have been satisfied.

Applicants are not required to present the results of SACU Aptitude and Achievement Tests for purposes of admission to the University. The presence or absence of SACU Test Scores will neither add to nor detract from an applicant's chances of admission to the University.

All Ontario Year 5 applicants will be notified on or after May 30, 1975, of the status of their application for admission. Year 5 applicants who do not receive an offer of admission at this time will have their applications deferred until their final Year 5 marks are received by the University. When these marks have been received, qualified applicants will be admitted until the remaining places are filled.

Ontario Year 5 applicants who receive an early offer of admission are encouraged to confirm as soon as possible, but are not required to respond before June 13, 1975.

The University reserves the right to withdraw the offer of admission if the applicant fails to complete his year satisfactorily.

b) Applicants who are not currently enrolled in an Ontario Year 5 programme can expect to wait several weeks before receiving a decision on their application. Some programmes require applicants to come to the University for an admission interview and a decision cannot be made in such programmes until after the interview has been accomplished and the Admissions Committee has had ample opportunity to consider all of the information that has been presented to it. Applicants who feel there has been an undue delay in the consideration of their application should check to ensure that all required documents have been sent to the appropriate Faculty area in the Registrar's Office.

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 their departmental undergraduate advisor. Information regarding pre-registration is outlined 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 29, of this calendar.

Release of Academic Information

The University may, on request from a Secondary School in Ontario, release the following academic information about the student without written approval of the student: the student's name, the programme in which the student is registered, and one of the four academic decisions for the particular year - passed, failed, supplementals required, withdrawn. Students not wishing to have this information released should notify the Registrar's Office accordingly.

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 any applicant will be made by any 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 is not profiting from University studies.
3

Fees and Registration
Fees and Registration

All students are required to pre-register in advance for courses they anticipate taking in the subsequent session/term. For students under the regular system of study this is done usually in March. For students in co-operative programmes, pre-registration is done during the on-campus term. First year students have the opportunity to pre-register during the summer months prior to September.

Pre-registration is the process of choosing courses and having them approved by the appropriate advisor prior to the beginning of classes. This action of pre-registration will produce the Student Schedule-Fee Statement. Students must then register (pay fees) using this Fee Statement. Registration will be completed when the courses have been approved, fees have been paid and the Fee Statement received by Financial Services.

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

Academic fees are due and payable on or before the final date of registration. Students who receive their fee statement by mail are normally expected to make payment by mail. Detailed instructions outlining the payment procedures will be included with the fee statement.

For those students who cannot register by mail, a registration period is held on campus prior to the beginning of lectures for each term. The dates of pre-registration and beginning of lectures are listed on page 7 of the calendar.

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

**Regular Students**
- 15 July 1975 for the 1975-76 Session.

**Co-operative Students**
- 15 July 1975 for the Fall 1975 term;
- 14 Nov. 1975 for the Winter 1976 term;

Fees may be paid by money order or certified cheque payable to “University of Waterloo”.

Fees may be paid in two instalments, but an extra charge of $10.00 for regular students, $5.00 for co-operative, and $4.00 for part-time students will then be added to the first instalment. The first instalment is to be paid at the time of registration and must be a minimum of 60% of the tuition fees plus 100% of the incidental fees. The balance is to be paid as follows:

**Regular Students**
- On or before the first day of the second term.

**Co-operative Students**
- On or before the first day of the eighth week of the current term.

Arrangement for payment of fees by scholarships, bursaries or by methods other than those outlined above must be authorized by the University Credit Manager.

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

Students who register after the start of classes will be assessed the following penalty:

**Full Time**
- First Day: $10.00
- Second Day: $15.00
- Third Day: $20.00
- Fourth Day: $25.00
- Thereafter: $25.00 plus*

**Part Time**
- First 2 Weeks: $5.00
- Third Week: $10.00
- Fourth Week: $15.00
- Fifth Week: $20.00
- Sixth Week: $25.00
- Thereafter: $25.00 plus*

*5% per month service charge applied to the balance outstanding and calculated from the due date.

Under no circumstances will a student (including part-time, correspondence, or multi-media) be allowed to register after the following dates:

<table>
<thead>
<tr>
<th>Session Term Starting</th>
<th>Last Date to Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 1975</td>
<td>14 November 1975</td>
</tr>
<tr>
<td>January 1976</td>
<td>30 January 1976</td>
</tr>
<tr>
<td>May 1976</td>
<td>12 June 1976</td>
</tr>
<tr>
<td>July 1976</td>
<td>14 July 1976</td>
</tr>
</tbody>
</table>

Failure to register by the above dates will indicate that the student is not returning for the current session/term and will result in cancellation of all academic
privileges for the current session/term.

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

Students must register on or before the start of classes whether or not a final class schedule has been received. Late fees commence the first day of classes. See page 6 for appropriate dates. Students who subsequently change programmes must re-register with the new fee statement within 5 days if the fees assessed have changed. No refunds will be processed unless this re-registration is completed. The original registration receipt must be produced at the time of re-registration.

A student who finds it necessary to withdraw from attendance is required to obtain a withdrawal voucher from the Registrar. This voucher, when signed by both the Dean and the Registrar, or their delegates, will entitle the student to a refund of a portion of the fees on the following basis:

a) Total tuition fee, less registration charge of $50.00, on a diminishing basis, calculated weekly over a total of 27 weeks for regular session students and 13 weeks for co-operative student terms.

b) Incidental fees for Federation of Students, Intercollegiate Athletics on a pro rata basis over 13 weeks for regular students and 6 weeks for co-operative student terms.

c) Original fee receipt must be turned in at the time of withdrawal. A revised receipt will be issued after the withdrawal procedure is completed.

d) No fees will be refunded unless the above procedure is followed.

The fee schedule shown is the one proposed for the 1975-76 year, and at the time of printing is still subject to review and possible change. If a fee change is made, a notice will be issued with a new fee schedule; however, the University does not undertake or accept responsibility to so notify all recipients of this calendar. The Board of Governors reserves the right to make changes in the published schedule of fees without notice.

<p>| Schedule of Fees – Undergraduate Programmes Tuition and Incidents for All Years |</p>
<table>
<thead>
<tr>
<th>Faculty or School</th>
<th>Session/Term</th>
<th>Tuition Fees</th>
<th>Incidental Fees</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>Session</td>
<td>$624.80</td>
<td>$53.00</td>
<td>$677.80</td>
</tr>
<tr>
<td>Engineering</td>
<td>Term</td>
<td>$390.20</td>
<td>$28.00</td>
<td>$418.20</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>Session</td>
<td>$624.80</td>
<td>$51.00</td>
<td>$675.80</td>
</tr>
<tr>
<td></td>
<td>Session</td>
<td>$659.80</td>
<td>$51.00</td>
<td>$710.80</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$390.20</td>
<td>$26.25</td>
<td>$416.45</td>
</tr>
<tr>
<td>Integrated Studies</td>
<td>Session</td>
<td>$624.80</td>
<td>$46.50</td>
<td>$671.30</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Session</td>
<td>$624.80</td>
<td>$51.50</td>
<td>$676.30</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$372.70</td>
<td>$26.50</td>
<td>$399.20</td>
</tr>
<tr>
<td>Science</td>
<td>Session</td>
<td>$624.80</td>
<td>$50.50</td>
<td>$675.30</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>$372.70</td>
<td>$26.00</td>
<td>$398.70</td>
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<tr>
<td>Optometry</td>
<td>Session</td>
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<td>$50.50</td>
<td>$675.30</td>
</tr>
<tr>
<td>Human Kinetics and Leisure Studies</td>
<td>Session</td>
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<td>$50.50</td>
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</tr>
<tr>
<td></td>
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<tr>
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<tr>
<td></td>
<td>2 courses (limit)</td>
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<td></td>
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<td>Incidental Fees</td>
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<tr>
<td></td>
<td>Co-operative Term</td>
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</tr>
<tr>
<td>Federation of Students</td>
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<tr>
<td>Intercollegiate Athletics</td>
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<tr>
<td>O.P I.R.G. (See Note 1)</td>
<td>$3.00</td>
<td>$1.50</td>
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<td>$4.50</td>
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<tr>
<td>Society Fees (See Note 2)</td>
<td>$3.00</td>
<td>$1.50</td>
<td></td>
<td>$4.50</td>
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</table>

- Session represents the traditional 8 month (September - April) period of study.
- Term represents the 4 month academic term for students registered in Co-operative programmes.
Note 1 – O.P.I.R.G. (Ontario Public Interest Research Group)
In June 1973, the Federation of Students petitioned the Board of Governors to assess each undergraduate student $3.00 per session for regular students and $1.50 per term for co-operative students as a contribution to O.P.I.R.G. This fee is voluntary, refundable, and not a requirement for registration. Requests for refunds or questions concerning O.P.I.R.G. should be directed to the on-campus O.P.I.R.G. office.

Note 2 – Society Fees
The following schedule of fees applies:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Regular Session</th>
<th>Co-operative Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts</td>
<td>$5.00</td>
<td>$4.00</td>
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<tr>
<td>Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Kinetics and Leisure Studies</td>
<td>$4.00</td>
<td>$2.00</td>
</tr>
<tr>
<td>Mathematics</td>
<td>$5.00</td>
<td>$2.50</td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>$4.50</td>
<td>$2.25</td>
</tr>
<tr>
<td>Science (including Optometry)</td>
<td>$4.00</td>
<td>$2.00</td>
</tr>
</tbody>
</table>

Payment of the Society Fee is required at registration but a student who does not wish to participate may obtain a refund by applying to the respective Society within three (3) weeks after the close of registration.

Miscellaneous Fees
Examination Supplemental each paper $10.00
Presiding fee (at outside centre each half day) $7.00

Returned Cheques – Handling charge of $10.00 plus late registration penalty as below.

Late Registration – Students who register after the final date of registration will be assessed the following penalty:

Full Time
First Day $10.00
Second Day $15.00
Third Day $20.00
Fourth Day $25.00
Thereafter $25.00 plus

Part Time
First 2 Weeks $5.00
Third Week $10.00
Fourth Week $15.00
Fifth Week $20.00
Sixth Week $25.00
Thereafter $25.00 plus

Residence Fees
Residence fees are payable by term and are due in full on 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 to be received during the term in question.

Further information concerning residences may be found in Chapter 5.

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

*1% per month service charge applied to the balance outstanding and calculated from the due date.
Duplicate fee receipt (per request) $2.00
Transcript of record (per request) $1.00
Scholarships
Bursaries, Prizes and
Financial Aid
Laurel Creek separates the main campus from the campus residences
Scholarships, Bursaries, Prizes and Financial Aid

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

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

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

Undergraduate Scholarships

University of Waterloo Entrance Scholarships
The University awards a number of Entrance Scholarships to entering students on the basis of outstanding performance in secondary school. In some faculties and departments, these Scholarships are also based on the results of the following competitions:
The Chem 13 NEWS Exam;
The Sir Isaac Newton Physics Test;
The Ontario Senior Mathematics Problem Competition.
Details regarding these Scholarships are listed on the following pages.
An application for admission to the University will suffice as an application for any Entrance Scholarship for which the student is eligible.

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 scholarships are awarded on the basis of academic achievement to students who are residents of Alberta.

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

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

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

Arts Faculty Scholarships
The Faculty of Arts, University of Waterloo is offering several entrance and upper year scholarships in order to recognize academic excellence. Entrance awards will be in the amount of $700 and will be awarded on the basis of Senior Matriculation marks along with secondary school recommendations. Second year awards will be based on previous years standing and in consultation with first year instructors. Third and fourth year scholarships will be based on previous years standing and will require the recommendation of the candidates' department. All upper year awards are valued at $600. Several other awards of a lesser amount will be available to both freshmen and upper year students. The amounts and successful candidates will be left to the discretion of the faculty.

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

Association of Professional Engineers Undergraduate Scholarship
The Association of Professional Engineers of the Province of Ontario offers three annual scholarships of $250, one to the student in each of the first, second and third years in an accredited engineering programme who has the highest average in the examinations for his year.

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

J.P. Bickell Foundation Scholarships
The Trustees of the J.P. Bickell Foundation provide a
number of J.P. Bickell Foundation scholarships of
$1,500, each 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
and maintain this standing throughout the programme.
The scholarship will be paid at the rate of $250 a term.

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

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

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

Chem 13 News Research Assistantships
The Department of Chemistry offers Chem 13 News
Research Assistantships to recognize academic excel-
ence 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 examina-
tion held in April. Students entering upper years in
Honours Chemistry (Co-operative or Regular timetable)
are automatically considered for the award.

Chemistry Scholarships
The Department of Chemistry awards Year 1
Chemistry Scholarships annually. Selection is mainly
on the basis of a CHEM 13 NEWS/Exam written in
Ontario secondary schools. Values are $2,000 and
$1,500 for one year.

Chemistry Scholarships of $500, $400, $300 and
$200 are also awarded to the top four students entering
Years 2, 3 and 4 in Honours Chemistry, (Regular or
Co-op). These scholarships may be subject to the
condition that no other awards be held concurrently.
The above scholarships will be awarded subject to
the availability of funds and the attainment of a
minimum academic standard by candidates.

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

Cominco Scholarships
To assist in ensuring a continuing supply of qualified
graduates in fields vital to industry in Canada, Cominco
Ltd. has established a programme of twenty-four
scholarships at specified Universities in Canada. One
of these scholarships will be awarded annually in the
form of a two-year award of $800 per year at the
University of Waterloo. It is open to students who, in
the Fall, will enter the penultimate undergraduate year
of a course leading to a degree in Chemical Engineering,
Honours Geology, Geological Engineering, Mining,
Mineral Engineering, Metallurgy, Metallurgical
Engineering, Soil Science or Agronomy. Students must
apply to the University of Waterloo by November 1st,
on forms obtainable from the Awards Officer, Univer-
sity of Waterloo, Waterloo, Ontario. Renewals for
the second year will be subject to attainment of
academic standards satisfactory to the Scholarship
Committee of the University.

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

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

Application forms should be requested from the
Awards Office.
Rene Descartes Scholarships, Fellowships, and Bursaries

Awards in varying amounts are offered through the Faculty of Mathematics to first year students enrolled in that Faculty and showing the University of Waterloo as their first choice on the application for admission to the university. In order to be eligible, a student must write the Ontario Senior Mathematics Problem Competition.

Applications may be received through the Associate Dean, Faculty of Mathematics.

Claude Neon Limited Scholarship

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

Application should be made to the Awards Officer.

Earth Sciences Scholarships

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

Elgin County Council Award

One award in the amount of $100 is offered to the student attaining the highest academic standing in any university year. The student will normally be a resident of Elgin County. Residents of the City of St. Thomas are ineligible.

G. Elmore Reaman Scholarship (History)

A scholarship in the value of $300 is offered each year to a third or fourth year student of the University for study and research in the Social History of Upper Canada, from the earliest time to 1818. The award will be made by the Department of History, on the basis of a formal research paper prepared by the candidate.

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.

Human Kinetics and Leisure Studies Faculty and Staff Scholarships

A limited number of entrance and upper year scholarships will be made available beginning in Fall, 1975. The amount of each award is yet to be determined. Scholarships will be based on academic achievement in the previous year.

Huron County Scholarship

Huron County Council is offering two $100 Scholarships to be awarded to the male and female from Huron County who obtain the highest standing regardless of the year in which he or she is registered.

S.C. Johnson and Son, Limited Award

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

James F. MacLaren Limited Award

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

Sir Isaac Newton Scholarships

The Department of Physics awards two freshman Sir Isaac Newton (SIN) Scholarships annually, based mainly on the results of the SIN Physics test written in Ontario Secondary Schools. Values are $2,000. and $1,500. respectively for one year, with an additional $1,950. over three more years as a SIN Assistant. SIN Scholarships are awarded annually to the top four students entering each of second, third and fourth years in Honours Physics, both Regular and Co-op. Values are $500., $400., $300., $200., in each year. No application is necessary to be considered for the scholarships in the upper years. (These scholarships may be subject to the condition that no other scholarships are held concurrently).
Sir Isaac Newton Assistantships
The Department of Physics offers Sir Isaac Newton (SIN) Assistantships to recognize and encourage academic excellence in students proceeding towards an Honours Physics degree. The awards are normally made to freshmen, and are valued at $2,600, payable $650 per year. Renewal is based on satisfactory academic standing. About ten new awards are given each year, based mainly on the results of the SIN test mentioned above. Recipients of this award are required to undertake a minor academic or research project within the Department.

Optometry Scholarships
The School of Optometry awards scholarships annually to students admitted to the School of Optometry from Year 1 Regular Science at the University of Waterloo. These awards will be made chiefly on the basis of scholastic achievement and as funds permit in Year 2 Optometry, Year 3 Optometry, Year 4 Optometry and Year 5 Optometry. No application is necessary.

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 $1200, 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 Scholarship Committee of the School of Optometry before August 31st, of each year.

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

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

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

University of Waterloo Engineering Scholarships
Several scholarships, each in the amount of $500, will be made available to both entering and upper year students in the Faculty of Engineering. For students entering Year 1, the decisions will be based on results from either the Ontario Senior Mathematics Problem Competition, the CHEM 13 Competition or the Sir Isaac Newton Competition and in addition, on the students’ overall academic record. For all other students, the decisions will be based on the individual’s academic record at the University of Waterloo.

St. Jerome’s College Awards
Five awards in varying amounts are awarded annually to first year students registered at St. Jerome’s College who combine high academic achievement, based on final Grade 13 marks, with financial need. Application should be made through the Office of the Dean, St. Jerome’s College.

The Father John Bullbrook Scholarships
These awards are the gift of the members of the Congregation of the Resurrection residing at St. Jerome’s College given in honour of the late Rev. John Bullbrook, C.R. who taught at the College. Five annual scholarships of $150 each are awarded to deserving students who combine academic excellence and contribution to College life. No application is necessary.

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. No application is necessary.

The following awards are available to students studying for the priesthood who demonstrate academic excellence and financial need:

The Schill Awards
Two awards in the value of $300, each are awarded annually to students registered through St. Jerome’s College in any year.
The J.J. Guam Award
For candidates for the Congregation of the Resurrection. One awarded annually in the value of $300.

The M. Winternemer Award
One awarded annually in the value of $300.

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

The Kehoe-Cosgrove Awards
For candidates for the Diocese of Hamilton. Two awarded annually in the value of $200 each.

Application for these awards should be made through the Office of the Dean, St. Jerome's College.

Bursaries

Note
Second class standing is normally required of applicants for bursary assistance. Students with student visas who have not been in Canada for more than one year will not normally be considered. Applications must be submitted 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.

Application should be made to the Awards Officer.

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

Applications on regular University forms must be submitted to 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.

Awards will be made by the Scholarship Committee.

Application for a bursary should be made through the Awards Office.

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 bona fide residents of the Province of Ontario.

Further information and application forms may be obtained from the Awards Office.

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.

Applications should be forwarded to the Awards Office.

Canada Packers Awards
Canada Packers Limited is making available two $100. awards to fourth year Chemical Engineering students and two awards to fourth year Mechanical Engineering students having attained high academic achievement in third year. One award will be made in each of stream 'A' and stream 'B' in each department. Other determining factors include personal characteristics.

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.

*Applications should be directed to the Awards Officer.*

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

*Application should be made through the Awards Office.*

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

*Students should make application through their high school or direct inquiries to the Awards Office.*

**The Hydro-Electric Power Commission of Ontario Bursary**
A bursary, of the value of $500, is offered annually by the Hydro-Electric Power Commission of Ontario to a student in second year in any of the following honours courses: Mathematics, Physics, Applied Science and Engineering. It is to be awarded to undergraduates with good academic standing who are in need of financial assistance. The bursary may be held concurrently with other awards where the need exists.

*Awards will be made by the Scholarship Committee. Application should be made through the Awards Office.*

**IBM – Thomas J. Watson Memorial Bursaries**
The University of Waterloo has been invited to participate in the IBM – Thomas J. Watson Memorial Bursary Programme, established by the IBM Canada Limited. The objective of the programme is to provide financial assistance to needy undergraduate students with good academic standing. This will apply to all years and faculties of the University. A bursary may be held concurrently with other awards provided that a definite need is established.

*Bursaries will be awarded by the Scholarship Committee. 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 $2,500, has been established by Interprovincial Pipe Line Company to benefit students beyond the first year who are in need of financial assistance. The company has stipulated that at least 50% of the funds granted must go to students in the applied sciences. Preference will also be given to students whose normal residence is Canada or the USA.

*Application for a bursary should be made through the Awards Office.*

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

*Application should be made through the Awards Office.*

**J.R. 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.

*Awards will be made by the Scholarships Committee. Application for a bursary should be made to the Awards Office.*

**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.

*Applications should be directed to the Awards Office, University of Waterloo.*

**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.

*Application should be made on the forms provided by the Awards Office.*

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

*Application should be made through the Awards Office.*

**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.

*Awards will be made by the Scholarships Committee.*
and the amount available may be apportioned among two or more students. Applications for a bursary should be made to the Awards Office.

Oxford County Bursaries
Oxford County Council has granted the University of Waterloo an amount of $1,000. to be distributed to Oxford County students excluding those from the municipalities of Woodstock and Ingersoll. Students must be of good academic standing and in need of financial assistance. Application should be made through the Awards Office.

P.L. Robertson Manufacturing Co. Ltd. Bursary
A bursary, to the value of $100., is offered annually by the P.L. Robertson Manufacturing Co. Ltd. The bursary is to be awarded to students in the Faculty of Engineering who are in need of financial assistance and who have satisfactory academic standing. Where the need exists the bursary may be held in conjunction with other awards. The Scholarships Committee will award the bursary and application should be made to the Awards Office.

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. Awards will be made by the Scholarships Committee. Application for a bursary should be made to the Awards Office.

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.

The Steel Company of Canada Limited Bursary
The Steel Company of Canada is offering an admission bursary in the amount of $500. each year for four years to give financial assistance to students of superior ability who might not otherwise go to university because of lack of funds. Applicants must be permanent residents of Canada and must have completed the final year's work for university entrance in one school year and have attained a minimum average mark of 66%.

The Stelco Bursary is not tenable with scholarships totalling in excess of $200. but may be held with other bursaries at the discretion of the university. Application may be made by writing to the Awards Office, University of Waterloo.

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

Prizes

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

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

a) Four 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, fourth and fifth years;
b) Four General Proficiency Prizes (value $150. each) awarded to the student in the School of Optometry standing second highest in General Proficiency in each of the second, third, fourth and fifth years;
c) In addition to the above, prizes are awarded for highest academic standing in certain second, third and fourth year subjects as funds allow.

All of the above prizes are made available through contributions of the following Canadian Suppliers and Laboratories:
Bausch and Lomb Optical Company (Canada) Limited, Toronto, Ontario
Dominion Contact Lens Laboratory, New Toronto, Ontario
Eastern Optical Laboratories Limited, Dartmouth, Nova Scotia
Gordon Contact Lenses, Inc., Rochester, N.Y.
Kahn Optical Company Limited, Toronto, Ontario
Monarch Optical Co., Toronto, Ontario
Omand Optical Co., Toronto, Ontario
Perfect Optical Co., Toronto, Ontario
Plastic Contact Lens Co., Toronto, Ontario
Professional Optical Co., Willowdale, Ontario
Superlite Optical Co., Toronto, Ontario

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

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

J.C. Thompson Memorial Prize (value $125.00)
The J.C. Thompson Memorial Prize is made to the final
year student in the School of Optometry who has ranked
highest in Optometry (Optometry 302, 312, etc.).

Percy Hermant General Proficiency Prizes
(value $200.00 and $100.00)
The gifts of Sydney Hermant are awarded to the
final year students in the School of Optometry ranking
first and second in general proficiency.

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.

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.

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 Canadian Contact Lens Society Prize
(value approximately $100.00)
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.

E.T. Davies Memorial Prizes
In memory of the late Professor E.T. Davies, his
colleagues in the Applied Mathematics Department
offer annually two prizes of the approximate value of
$100. each: one prize is for the first year student,
enrolled in the Faculty of Mathematics, who ranks first
in the final examinations; the other is for the third year
Applied Mathematics student who ranks first on the
final examinations. In the initial year the value of the
first year prize will be increased by an amount donated
by Professor Davies students.
No application is necessary.

Faculty and Staff Prize
The University of Waterloo Faculty Association has
established a fund to award prizes, of the value of $50.
each, to the students who rank first in the final
examinations of any non-graduating year of each
Faculty. This is provided that the student attains a
minimum of 80% in the final examinations, is not
repeating the year, has no supplemental examinations,
and carries a full course load.
An application is not required. The Faculty Association
has the final decision in all cases.

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 pro-
grame which combines studies in Chemistry and
Physics.

Peonsy 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.

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 Bobby Bauer Memorial Award
The Bobby Bauer Memorial Foundation will make one
or more awards annually to students demonstrating
outstanding proficiency in Hockey who qualify for
admission to a full-time undergraduate programme at
a Canadian university.
Application should be made prior to August 31 on
forms provided by the Foundation. A letter of refer-
ce from a person actively involved in Hockey must
accompany each application.
**Scholarships, Bursaries, Prizes and Financial Aid**

**Government Sponsored Institutional Loans**

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

The Bruce Wyler Kelly Memorial Prizes
These book prizes were established in 1960 by relatives and friends in memory of the late Bruce Wyler Kelly, the first Dean of Science at the University of Waterloo, 1958-1960. These prizes are awarded in the General Science Programme at the end of the second year to two students, one registered with Biology as his major subject and one registered with Chemistry as his major subject. Qualifications are: (a) a clear pass standing and (b) highest standing in Biology with a minimum of B standing in Chemistry or highest standing courses taken with a minimum of B standing in the average of these courses.

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

The Chemical Institute of Canada Prize
Two awards, one each to a Chemistry and a Chemical Engineering student, are made annually by the Institute. The awards, consisting of an inscribed medal and a $25. gift, are given to the student standing at the top of the penultimate year of either course. No application is necessary.

Government Sponsored and Institutional Loans

Supplementary financial assistance is available in varying degrees on a need assessment basis to students who are Canadian citizens or landed immigrants. Each province of Canada operates its own assistance programme. These are intended to assume that no student is prevented from pursuing post-secondary education because of a lack of adequate family financial resources, but are based on the assumption that it is primarily the responsibility of the student and his parents to provide the required funds. When the family resources are inadequate, assistance should be applied for from the appropriate provincial authority.

In Ontario, the Ontario Student Assistance Programme (O.S.A.P.) combines loan assistance available through the Canada Student Loan Programme with, in many cases, non-repayable grant assistance from the Province of Ontario. The loans are interest-free and non-repayable until six months after the student has ceased to be a full-time student at an approved post-secondary institution. O.S.A.P. applications and information are available from the Awards Office.

Non-residents of Ontario must apply to their own province for Canada Student Loans Plan Assistance as well as any provincial aid that may be available.

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. Further information may be obtained from the Awards Office.

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. Further information may be obtained and application may be made through the Awards Office.

Engineering Society “A” Loan Fund
This fund was established by the Engineering Society “A” to assist students in need of short term loans. Further inquiries should be directed to the Awards Office.

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. Further information may be obtained, and application may be made through the Awards Office.

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. Further information may be obtained from the Awards Office.

Environmental Studies Society Loan Fund
Short term non-interest bearing loans are available to full-time undergraduate students enrolled in the Division of Environmental Studies. The maximum loan is normally $100. These funds are made available by the Society and represent a part of the proceeds of functions sponsored by the Society. Application should be made to the Awards Office.
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. Further information may be obtained from the Awards Office.

Graham, Myall, Thomson Memorial Fund
A memorial fund has been instituted by the classmates of the late I. 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. Further information may be obtained from the Awards Office.

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. For further information, inquiries should be directed to the Awards Office.

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

The 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. Application should be made to the Awards Office.
Student Services
Student Services

Introduction
The following brief descriptions will introduce readers to the administrative departments, organizations and services with which students are likely to have the most contact during their years at the University.

Further and more detailed information concerning these services can be obtained by contacting the group concerned.

Federation of Students

"The philosophers have only interpreted the world, in various ways; the point, however, is to change it." Marx

The complementary education received from participation in extracurricular activities, in many cases, has a significant, beneficial and lasting effect on students as formal curricular education. At the University of Waterloo the opportunity to participate in such activities is provided for those who wish to take advantage of it, by the Federation of Students and its various agencies. All students of the University of 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. It supersedes the Constitution of the Federation which was approved in a campus-wide referendum in 1964.

Objects
The principal "Objects" of the Federation are:
- To promote the welfare and interests of the students of the University of Waterloo in all matters respecting their common interests.
- 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 communication between the student body and the duly elected and appointed authorities of the University of Waterloo.

The Students' Council
Twentynine elected members plus officers make up the Students' Council which is the governing body of the Federation. 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. Almost all of the social cultural activities of the student body are managed by the Students' Council as well as off-campus representation of the student body.

Organization
The activities of the Students' Council are carried out by its various boards and committees which are directed by a student chairman.

The Executive Board
The Executive Board is composed of the principal officers of the Students' Council 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 the activities and programmes of all other Boards and provides liaison between them.

The Creative Arts Board
The Creative Arts Board, whose membership includes students, faculty and staff, provides participating activities in music, drama and dance. Groups in each area are assisted by professional directors to prepare for evening and noonhour presentations.

Included are: Music - Concert Choir, Chamber Choir, Concert Band, Little Symphony Orchestra, Stage Band, Warriors Band and Folk Song Club. Drama - University Players. Dance - Ballet Club, Modern Dance Club, and U of W Repertory Company.

The Board of External Relations
The Board of External Relations represents the Federation of Students, and handles its activities, programmes and organizations in all areas that are outer-directed in relation to the campus; activities which connect and relate the student to the local, national and international communities. Board functions are roughly divided into three commissions: Domestic Affairs, International Affairs and Information and Services, and a Hosting Committee which welcomes official student groups from other Canadian campuses and other countries. In the past the Board, through its Commissions, has provided or worked for: a high school tutorial service, overseas travel service, seminars on the Canadian Indian, speakers from foreign countries, a court of revision on campus for provincial elections, a Waterloo drop-in centre, a study of Red China, and many other activities within its broad area of concern. Through the International Affairs Commission the Board also provides support for the Student United Nations Association of Canada (S.U.N.A.C.), Canadian University Services Overseas (C.U.S.O.), Conference on Inter-American Student Projects (C.I.A.S.P.), and others.

The Board of Education
The Board of Education sponsors programmes to examine and improve the quality of education. These activities include anti-calendars, course critiques,
speakers, seminars, films, research, and attempts to organize and co-ordinate student activities to promote social change.

The Board of Entertainment
The Board of Entertainment co-ordinates and supervises all campus-wide special programmes, including, Freshman Orientation, "pubs", concerts, Winter Weekend, and Summer Weekend. The Board also maintains a classical record collection for the use of all students, supports the House of Debates, the Flying Club (which operates three aircraft and a flying school), and assists the operation of over thirty clubs whose membership is open to all members of the Federation.

Persons wishing more information on any aspect of Federation activities are advised to write:
The Federation of Students
University of Waterloo
Waterloo, Ontario, Canada N2L 3G1

Cultural Programme Centre
The Cultural Programme Centre, room 254 in the Modern Languages Building, is the home of cultural programming and activities on the university campus.

A Creative Arts Board, under the jurisdiction of the Federation of Students, provides participating activities in music, drama and dance. Professional directors assist these groups to prepare for evening and noon hour presentations.

A number of professional attractions are presented throughout the year. Brochures and calendars are available upon request.

The Central Box Office handles all the Cultural Programme Centre's tickets for professional and participating programmes. As a service to the university community, tickets are also sold on behalf of other organizations sponsoring events of general interest.

The Theatre of the Arts, and the Humanities Theatre are available as educational and cultural resources. Contact the Reservations office in the Centre for booking information.

The Art Gallery arranges a series of 10 - 12 exhibitions each year. Its permanent collection, now in excess of one hundred works, is distributed throughout the university to enrich campus life.

Book Store
University of Waterloo students may purchase text books, stationery and engineering supplies at the University's modern Book Store located on the main floor of the South Campus Hall. The Book Store is open weekdays from 9:00 a.m. to 5:00 p.m. throughout the year. Book Store hours are extended in the months of September and October. Students are advised to watch the bulletin board for further notices. In addition to text books, reference material, paper supplies, crested gift and souvenir items, and drawing materials, the University of Waterloo Book Store also features the largest display of quality paperbacks in Kitchener and Waterloo.

Department of Athletics

Director
C.A.W. Totzke, B.A. (Waterloo)

Assistant Director (men)
W.A. Delahey, B.A. (Western)

Assistant Director (women)
P.A. Davis, B.P.H.E. (Toronto), M.Ed. (North Carolina)

Assistant Director (men's intramurals)
P.D. Hopkins, B.A. (Carleton), B.P.E. (Waterloo)

Assistant Director (women's intramurals)
S.E. Kemp, B.A. (Sir George Williams)

Staff
P.G. Condon, B.A. (Western)
J.A. McCrae, B.A. (Western Michigan), M.Sc. (North Carolina)
D.G. McCrae, B.A. (Western), B.P.E. (McMaster)
R.C. McKillop, B.A., B.P.E. (Waterloo)

The Department of Athletics offers a full and complete programme of intercollegiate and intramural activities for the enjoyment of the university community. "Something for everyone," has often been suggested as the motto.

On the intercollegiate scene, students at the University of Waterloo have the opportunity of participating in what are generally described as the best intercollegiate leagues in the country. The male intercollegiate teams participate in the Ontario Universities' Athletics Association while the female teams compete in the Ontario Women's Intercollegiate Athletics Association.

The Warriors, as the male teams are named, compete intercollegiately in over twenty activities, ranging from the traditional football, basketball and hockey to the not-so-well-known, judo, fencing and karate.

The female teams are known as the Athenas. Presently they compete in over eleven activities also from the traditional basketball, volleyball to the lesser-known synchronized swimming and field hockey.

For those students not wishing to participate in the intercollegiate programme, the Department of Athletics offers a full and extremely varied intramural programme. In general, the intramural programme which
is open to both males and females, is divided into four broad spheres of activity. They are: a competitive programme, a recreational programme, an instructional programme and a club programme.

The competitive intramural programme is the most structured level of intramural activities. The campus is divided into competitive units and competition takes place in both individual activities and team sports. The competition is very keen as the students strive to make their unit the leading one on the campus. There are over 24 activities offered in the competitive programme.

The recreational programme is geared to the leisure-time pursuits of the students. This level is much less structured than in the competitive programme. Team sports are offered to any group of students that wish to form a team. Individual activities, e.g., squash, are scheduled for the students and a large amount of free time is made available in the athletic facilities during which the students may "do their thing."

The instructional programme is intended to impart some basic knowledge of various activities in which the students have shown an interest. For example, many students come to the University of Waterloo without ever having learned how to swim. In order to satisfy their desire to learn how to swim, an instructional programme has been set up in that area. Similar programmes are offered in such areas as golf, squash, judo, karate and many, many more.

The club programme at the University of Waterloo attempts to bring together those persons interested in furthering their skill or even developing a skill in a group setting i.e. learn with your peers. Club activities vary from bowling to white-water canoeing.

It is the desire of the Department of Athletics to provide students at the University of Waterloo with the opportunity to make their stay at Waterloo a full and enjoyable one through experiences and endeavours outside the classroom. The Department, with student input, is continually reviewing and revising its programme to accomplish this objective.

Counselling Services

Director
W.W. Dick, B.A., B.D. (Toronto), M.A., Ph.D. (Ottawa)
A.L. Evans, B.A., B.D. (Toronto), S.T.M., D.Min.
(Boston)
J.B. Goodman, B.Sc. (Toronto), M.A., Ph.D. (Waterloo)
J.C. Hawkins, B.A. (Western Ontario)
L. Kellar (Ms), B.A. (Queen's), M.A.Sc. (Waterloo)
R.L. Knight, B.A. (Antioch)
R.P. Kunkle, B.A. (Oregon College of Education),
M.S. (Oregon)
S. Minas (Ms.), B.A. (Wayne State), M.A. (Ohio State)
M. Nowak (Ms), B.A. (Windsor), M.S.W. (W.L.U.)
R. Remple (Ms), B.A. (Goshen College)

I.J.H. Smart, B.A. (R.M.C.), B.A. (Queen's),
M.A.Sc. (Waterloo)
R.J. Walsh, B.A. (Queen's), M.A.Sc. (Waterloo)
O. Weizmann (Ms), B.A. (Ohio State), M.Ed., Ph.D.
(Illinois)
J.L. Williams, B.A., M.A. (Alberta), Ph.D. (Missouri)
J.J. Wine, B.A. (Bridgewater), M.S. (Iowa State),
Ph.D. (Alberta)

The goal of the University Counselling Services is to provide effective assistance to individual students. More specifically, professionally trained counsellors wish to help the student with his/her university years. Our aim, first and foremost, is to help the student develop his/her own resources and is based on the philosophy that the resources and responsibility for change lie within the student. Successful counselling should result in a student being able to generalize methods he/she learns to a variety of other situations and relationships.

Counselling Services offers a wide variety of programmes and techniques (including individual and/or group counselling, psychological and vocational testing, reading and study skills, and a self-serve reference and loan library of occupational, educational and personal information, etc.) which aim to help the student better understand him/her self in relation to the world around him/her.

The Counselling Service Centre is located on the 2nd Floor of the Ira G. Needles Hall. Appointments can be made by dropping in to the main office (Room 2080) or by phoning 885-1211, ext. 2655 any time from 8:30 - 5:00, Monday through Friday. Counsellors are associated with the faculties of Arts, Engineering, Environmental Studies, Human Kinetics and Leisure Studies, Mathematics, Science and with Health Services.

Counselling Services also assists student managed programmes that apply the concept of "peer-counselling." These programmes include:
1) Hi-Line. A telephone "help" service that handles calls concerning many types of problems from 7:00 p.m. to 7:00 a.m. any night of the week.
2) Birth Control Centre. Assistance and information are provided on topics of contraception, venereal disease and abortion.
3) Countryman Counselling. Volunteers are available to discuss with newly arrived countrymen various aspects of becoming accustomed to Canadian life.

The International Student Office is located at the Counselling Service Centre. Any international students who require information, e.g. Immigration laws, etc. may feel free to visit the office.
Careers Information Centre

Supervisor
D. Robinson, B.A. (Waterloo)

The Careers Information Centre assists students in their personal development and educational and career planning. It is sponsored by the Departments of Co-ordination, Counselling, and Career Planning and Placement.

Information is available to students regarding their current personal circumstances as well as plans for the future. In addition to educational and career information, a wide range of books, pamphlets, magazines and brochures is on hand covering topics such as drugs, contemporary society, personal development, women's roles, travel etc. Also supplied are up-to-date facts on special programmes such as CUSO, Company of Young Canadians, etc.

The Centre contains literature on a broad range of potential employers - institutional, governmental and industrial. This can be quite helpful prior to interviews for either graduating or co-op undergraduate students. The calendar shelves provide current material from universities, professional schools, and community and teachers colleges.

The Careers Information Centre is located on the first floor of the Ira G. Needles Hall.

Campus Health Services

Medical Director
D.E. Andrew, B.A., M.D., F.R.C.P.(C)

Head Nurse
S.M. Gutenberg, R.N., R.P.N.

Health Services is a medical clinic, situated near the centre of the campus, which provides health care to registered students. It also provides nursing services to faculty and staff, and emergency care to anyone on the campus.

Health Services operates an out-patient clinic, a 12-bed infirmary, and a vision clinic. During most of the year nurses are on duty 24 hours daily. Health Services works closely with Counselling Services and a counsellor has an office in the clinic.

The medical staff consists of two full-time doctors, as well as several family physicians and gynecologists who attend on a part-time basis. Referrals are made to local specialists, and Kitchener contains two excellent hospitals. There is always a doctor on call for Health Services, and each hospital has a physician on duty constantly in its emergency department.

Several lectures and panel discussions on current health topics are sponsored yearly by Health Services. These include such topics as sex education, abortion, drug abuse, and venereal disease.

Preventive medicine is a prime concern of Health Services, as shown by an active programme on birth control.

Health Services' budget is provided partly from medical insurance plans and in part from the general University budget. Physicians' services are covered by OHIP or other medical insurance plans. Students not carrying health insurance are responsible for paying their own doctor's fees.

Students should make every effort to be aware of the complexities of medical and hospital insurance to be certain that they are insured and that they are taking full advantage of the premium assistance. As part of the tuition fee paid at each registration, the student purchases an inexpensive insurance plan which provides coverage over and above OHIP. A booklet containing more details of Health Services' functions and outlining the medical insurance plans is available at Health Services.

Residence Information

(All fees listed in this section are subject to change)

Three autonomous housing operations exist at the University which together accommodate approximately 4,000 students annually in Residence. These are:

1) University Operated Residences and Off-Campus Housing
2) Federated and Affiliated Colleges.
3) Student Co-operative Residences

Students who wish to apply for residence in the University operated residences - Village 1, Village 2, and Minot Hagey, must have been academically accepted by the University and have received a "Permit to Register" before a residence application form will be sent to them.

Apartments for married students and their families are available on campus in the Married Students' Apartment Complex. The complex is operated by the University through the office of the Director of Housing and Residence Operations.

Those wishing to secure off-campus accommodation should attempt to do so as soon as possible. By late July almost all accommodation close to the University is rented. The best time to secure accommodation is during the period April - May. Off-campus housing must be negotiated on a personal basis between landlord and student (tenant). Current lists are available from the Housing and Residence Operations Office on campus, however, the University neither inspects nor approves off-campus housing.

The Housing Office, located in the Ira G. Needles
Hall, is open between the hours of 8:30 a.m. and 4:30 p.m., Monday to Friday.

Residences – University Operated

The fees shown are valid only for the 1974-75 academic session. A change in the present residence fee structure will be made by the Board of Governors early in 1975 and will be effective for the 1975-76 academic session.

University of Waterloo Residences

The University of Waterloo Residences (non-denominational) known as “Student Village 1”, “Student Village 2” and “Minota Hagey” are adjacent to the teaching facilities of the campus and are under the jurisdiction of the Warden.

Village 1

The residence portion consists of 26 houses with a total of 1263 rooms of which 875 are single rooms, 372 interconnecting rooms and 8 are double rooms. Each House is under supervision of a Don. Accommodation is available for 908 men and 355 women.

Village 2

Consists of 480 double rooms which will accommodate 960 residents. In addition, 20 Don’s suites are available as well as accommodation for 2 tutors.

Fees

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<th>Per Academic Year</th>
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<td>$670</td>
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<tr>
<td>Double</td>
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</table>

Minota Hagey Residence

The Minota Hagey Residence is a residence for graduate students with preference being given to women applicants. No major dining facilities are provided; however kitchens and refrigerators are available in sufficient quantity that most students do their own cooking.

Fees

<table>
<thead>
<tr>
<th></th>
<th>Per 4 Month Academic Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>$440</td>
</tr>
</tbody>
</table>

Residences – Federated and Affiliated Colleges

Students applying for residence in the Federated and Affiliated College residences are encouraged to apply to the College of their choice as early in the year as possible. Applications for residence in the Colleges are welcomed early in the Winter, and provisional offers of residence admission are made by some of the Colleges (i.e., Conrad Grebel and St. Paul's) before academic acceptance by the University. Of course, final confirmation of admission is given only after students have received academic admission to the University.

Conrad Grebel Residence

Conrad Grebel is a Mennonite residential and teaching college and a student centre. It welcomes students who are attracted to its small, people-oriented programme and its contribution to the U of W in Arts, History, Music, Religion, and Sociology.

The residence is open especially to students who wish to examine within a Christian context value questions confronting them in the university and society. The faculty of the school is very personally a part of this quest.

The residence provides accommodation for 100 students in double rooms and facilities for non-resident students who want to become a part of the College.

Students are encouraged to apply for residence when they apply for admission to the University, even though their admission to Conrad Grebel College depends on their acceptance by the University of Waterloo.

Fees Per Academic Year

<table>
<thead>
<tr>
<th></th>
<th>Per Academic Year</th>
<th>Per Academic Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double</td>
<td>$1200</td>
<td>$600</td>
</tr>
</tbody>
</table>

Fees per Term (Fall and Winter), $600

Fees for Spring Term

<table>
<thead>
<tr>
<th></th>
<th>Per Academic Year</th>
<th>Per Academic Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>$660</td>
<td></td>
</tr>
<tr>
<td>Double</td>
<td>$610</td>
<td></td>
</tr>
</tbody>
</table>

Renison College

Renison College is an Anglican undergraduate arts college affiliated with the University of Waterloo since 1960. The College provides accommodation on campus for 97 men and 80 women.

Admission to residence is open to students enrolled in Renison College General Arts Courses and Social Science (Applied) Programme and others registered in any faculty of the University.

Fees

<table>
<thead>
<tr>
<th></th>
<th>Per Academic Year</th>
<th>Per Academic Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>$1320</td>
<td>$660</td>
</tr>
<tr>
<td>Double</td>
<td>$1220</td>
<td>$610</td>
</tr>
</tbody>
</table>

Spring Term

<table>
<thead>
<tr>
<th></th>
<th>Per Academic Year</th>
<th>Per Academic Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>$425</td>
<td></td>
</tr>
<tr>
<td>Double</td>
<td>$400</td>
<td></td>
</tr>
</tbody>
</table>

St. Jerome's College

St. Jerome's College is a Roman Catholic liberal arts college federated with the University of Waterloo. Its residence is in the heart of the campus and offers both single and double accommodation to 120 men. Consideration is granted first to applicants registered at St. Jerome's College with the remaining rooms being allocated to those registered in faculties at the University.
Fees Per Academic Year Per Academic Term
Single $1300 $650
Double $1200 $600

Notre Dame College
Notre Dame College is an independent Roman Catholic women's residence conducted by the School Sisters of Notre Dame. Situated on the same piece of land as St. Jerome's College its 20 single and 51 double rooms accommodate 122 students. Prior consideration is granted to those students who are registered at St. Jerome's College but traditionally the makeup of Notre Dame has been representative of all the faculties of the University.

St. Paul's College
St. Paul's is a residential and teaching affiliate of the University, sponsored by the United Church. Through a programme of student activities, including a students' council, intramural sports teams, community dinners, a chapel group and interest groups engaged in a variety of activities and social projects within and outside of the University, the College seeks to bring students from a variety of backgrounds into a meaningful community life.

The residence provides accommodation in 75 semi-private rooms for 150 men and women. A limited number of Associate (non-resident) members of the College are admitted each term. St. Paul's offers courses in Religious Studies for academic credit.

Student Co-operative Residences
Waterloo Co-operative Residence Incorporated is a student built, owned, and operated residence community offering co-ed residence accommodation to both single and married students.

Hammarskjold House
105 students
15 singles: $540
90 doubles: $490

Phillip Street Residence
288 students
96 singles: $570
192 doubles: $520

Student Co-operative Residences
Lease
1 Bed'r'm 2 Bed'r'm
per month per month
4 month $145 $165
8 month $140 $160
12 month $135 $155

Individual meal plans are also available for non-resident students at both Hammarskjold House or Phillip Street.

Married Students' Apartments
Location
The Married Students' Apartments at the University of Waterloo are located on the South East corner of the Main Campus between University Avenue West and Seagram Drive. The complex consists of 2 fourteen storey high rise towers each containing 120 one-bedroom apartments and 4 three storey courts each containing 90 two-bedroom walk-up apartments.

How to Apply
Application Forms are available from the Manager to whom the completed application form should be returned.

Lease
Subject to further evaluation the rental rates are:

Lease
1 Bed'r'm 2 Bed'r'm
per month per month
4 month $140 $160
8 month $135 $155
12 month $130 $150

Enquiries
The Manager's Office is located on the first floor of the West Tower in the Married Students' Apartment complex and is open from 8:00 a.m. to 5:00 p.m. Monday to Friday.
Telephone: 884-0310
or write:
The Manager, Married Students’ Apartments,
Room 0104,
159 University Avenue West
Waterloo, Ontario, Canada.
N2L 3E8
Office of the Dean of Women

The Office of the Dean of Women serves as a general information and advisory centre for all students. The office is open to students at regular hours and initial contact with women students is made through pre-arranged informal interviews.

Because most questions concern the academic life of the student, this office acts as liaison between faculty/administration and students in matters of course or programme changes, study habits, meeting deadlines and effects of personal problems on academic performance – in short, the office helps the student to achieve her academic goal.

Office of the Registrar

The Office of the Registrar is basically responsible for the administration of academic policies and procedures as they relate to undergraduate students in the University. These responsibilities include admissions, registration, student records, transcripts, scheduling of courses and examinations, convocation, student awards, secondary school liaison, and publications such as the academic calendar and admission brochures. The office is organized primarily according to the faculty structure of the University. The Assistant Registrars, each with a clerical staff, are responsible for the duties that relate to a particular faculty area.

The primary contact that a student will have with this office will be with the Assistant Registrar who is responsible for the faculty area in which the student is registered.

A listing of the organization of the office is found under the Chapter on Governing Bodies and Staff.

The Office of the Registrar also serves as the primary contact of the University for general inquiries regarding undergraduate programmes. Prospective applicants and students currently enrolled in the University are encouraged to contact the office for assistance regarding any aspect of student admission/academic records.

Secondary School Liaison

Secondary School Liaison at the University of Waterloo is regarded as having two major areas of involvement: those activities taking place essentially on campus, and those efforts designed to reach students in their own geographical areas across the Province.

In the first instance, there are thousands of visitors annually attending two major on-going Faculty-initiated programmes: Computer Science Days and Science Waterloo Days. Also, of prime importance, are the large number of visitors who request either a tour of the campus, or an interview within a specific interest area. These latter contacts are handled by the Second-
The Departments of Co-ordination and Career Planning and Placement
Students in co-operative programmes get help from the Co-ordination Department in setting up job interviews.
Departments of Co-ordination, and Career Planning and Placement

Director, Co-ordination
R.J. Wieser, B.E. (Saskatchewan), P.Eng.

Director, Career Planning and Placement

Operations Analyst
J.R. Culby, B.Comm. (McGill)

Department of Co-ordination

The Department of Co-ordination is responsible for the work terms in the co-operative programs. The staff in the Department is comprised of professional personnel having extensive experience related to their fields of service in the Department.

Director
R.J. Wieser, B.E. (Saskatchewan), P.Eng.

Engineering
Programme Administrator, Faculty Liaison

Programme Administrator, Operations
J.C. Wilson, B.Sc., C.E. (U.N.B.), P.Eng.

Assistant to Programme Administrator

Co-ordinators
D.G.S. Anderson, B.A.Sc. (Toronto), P.Eng.
G.P. Berthin, B.Sc. (Manitoba), Eng.
G.P. Dobbin, B.A.Sc. (Toronto), P.Eng.
A.T. Girard, B.A.Sc. (Toronto), P.Eng.
R.A. Grant, B.Sc. (Queen's), P.Eng.
R. Grant, B.A.Sc. (Toronto), P.Eng.
D.S. Harris, B.Eng. (McGill), P.Eng.
L.B. Jones, B.A.Sc. (Toronto), P.Eng.
A.L. Lind, B.Sc. (Queen's), Eng.
R. Mateyk, B.A.Sc. (Toronto), P.Eng.
R. McDowell, B.Sc. (Saskatchewan), P.Eng.
W.A. Runge, B.Sc. (Queen's), P.Eng.
M.M. Smith, B.Sc. (Queen's), P.Eng.

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

Co-ordinators
L.R. Bricker, B.Sc., M.Sc. (Waterloo)
W.J. Palmer, B.Sc. (St. Francis Xavier), M.Sc. (Dalhousie)

Co-operative Mathematics
Options in Actuarial Science
Computer Science, Optimization, Business, Teaching, Chartered Accounting and Statistics

Programme Administrator
B.A. McCallum, B.A. (Western)

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

Co-ordinators
J.C. Banks, B.Comm. (Queen's)
J.T. Boniface, B.Sc. (Waterloo)
R.W. Hancox, B.A.Sc. (Waterloo)
E.M. Johnson, B.A. (Queen's)
E.R. Pyatt, B.A. (Waterloo)
S.R. Stankus, B.Sc. (R.M.C.)
G.M. Subasic, B.A.Sc. (Washington)

Co-operative Kinesiology, and Recreation
Programme Administrator
B.A. McCallum, B.A. (Western)

Co-ordinators
W.B. Puller, B.A. (Western)
M.A. McMartin, B.A. (Western)
P. Uptgrove, B.Sc. (Waterloo)

Environmental Studies - Architecture
Programme Administrator
J.W. Hoag, B.Arch. (Toronto)
Co-ordinator
W.G. Dailey, B.Arch. (Liverpool)

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. At Waterloo, most programmes consist of eight four-month academic terms. Thus the practical experience is in no sense a substitute for, but is rather a complement to, the academic studies.

The motivation, responsibility and opportunity for insight gained through co-operative education can be of inestimable value to the student's future. The co-
operative principle is important precisely because it enables those with a career orientation to become full-time students of their subject—not only during the academic terms on campus but 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, the professional guidance involved, and generally the whole management of the co-operative employment scheme is the responsibility of the Department of Co-ordination. The Co-ordinators counsel the students, visit them on the job, and assist them to adjust to work situations and professional development.

**The Work-Study Sequence**

In most of the co-operative programmes at Waterloo, all Year 1 students enroll in September and spend the first term together at the University. As indicated on the diagram, they rejoin as a class for the last term to complete their course and graduate together. Between the first and last terms, each class is split into two approximately equal groups for continuity of employment opportunity in the co-operative programme. 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 course and the other having a double academic term at the end of the course. The final choice of group is made by students during interviews with Co-ordinators shortly after registration. As far as possible students' choices will be honoured, but in the case of a major imbalance, students may be requested to enter the deficient group. Precise dates for the beginning and end of various terms are shown in the Academic Calendar.

The eight terms of study and six terms of employment provided in the co-operative programmes are arranged as shown in the diagram.

<table>
<thead>
<tr>
<th>1975</th>
<th>1976</th>
<th>1977</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
</tr>
<tr>
<td>First Term</td>
<td>Second Work Term</td>
<td>Work Third Term</td>
</tr>
<tr>
<td>1A</td>
<td>1B</td>
<td>1</td>
</tr>
<tr>
<td>First Term</td>
<td>Work Term</td>
<td>Second Work Term</td>
</tr>
<tr>
<td>1A</td>
<td>1</td>
<td>1B</td>
</tr>
<tr>
<td>1978</td>
<td>1979</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
</tr>
<tr>
<td>Work Fifth Term</td>
<td>Work Sixth Term</td>
<td>Work Seventh Term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fourth Term</td>
<td>Work Fifth Term</td>
<td>Work Sixth Term</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exceptions occur in the co-op pattern for some programmes. In Kinesiology and Recreation, all first year students remain on campus for eight months and proceed on their first work term in the Spring. In Systems Design (Engineering) and Chartered Accounting (Mathematics), first year students are at the University for four months and have their first work term in the Winter. In Earth Sciences the co-operative programme consists of a single group and begins in the student's second year. Variations of the standard programme are used in Applied Physics, Environmental Studies—Architecture and the option in Co-operative Mathematics for prospective high school teachers.

**Work Terms**

A basic requirement of the co-operative programmes at the University of Waterloo is satisfactory performance during work terms.

Registration in a co-operative programme commits students to the acceptance of employment either through the regular interview procedure or, where their best interests are served, on an assignment that the Department may determine. All positions held by students must be approved by the Department of Co-ordination.

By registering in a co-operative programme, students give permission for the release of their grades to employers and to prospective employers.

Students and employers choose each other through the following process. Job notices are posted on Department of Co-ordination bulletin boards, or printed in tabloid form, and students are asked to examine the notices and indicate their interest by applying for interviews. Students make these applications by completing and returning to the Department specially designed computer cards which are made available to them.

Following receipt of these applications, each employer is mailed the record of all students who have
applied for interviews with that organization. These student records consist of the academic grades and the work term performance grades, and a resume if provided by the student. For first year students, Grade 13 marks are the only academic grades sent. For new students in upper years, marks from previous institutions are not included. A list of the students whom the employer wishes to interview is returned and, from these, a schedule of interviews is drawn up.

Interviews arranged through this procedure are conducted on campus in the offices of the Department. When students have completed all their interviews they rank (on cards provided by the Department and given them by the interviewers) in order of preference, the employers by whom they were interviewed. These cards are then submitted to the Department. In the same manner students are ranked by employers and a computer is used at this point to match the interests of both parties. Under this procedure, there will be employers and students who do not obtain students and/or jobs. In such cases the Department will make every effort to place these students and satisfy the employers where the best interests of each can be served. If in the course of the interviews or while making the preference selection, it becomes apparent that the student is unable to accept a particular job (or two maximum) this must be discussed with the Department of Co-ordination before refusing the job(s). Failure to do so may result in the student being removed from the placement procedures.

It should be noted that a student is obligated to accept the employment obtained through the above procedures unless extenuating circumstances prevail, in which case the Department of Co-ordination must be consulted and permission obtained before the job is refused.

Salaries paid co-operative students are determined within the employer's own wage structure, although employers may consult with the Department of Co-ordination. Wages can be expected to increase when merited as the student progresses through the course and assumes more responsibility. However, the student should not expect the income from the work terms to provide complete self-support.

Students in co-operative programmes are required to return for a second work term when acceptable to employers. First work terms with employers include learning periods varying in length with the complexity of the jobs. Second work terms provide the students with an opportunity for better assessment of the jobs and provide the employers with the benefit of increased productivity. In many instances the second term also offers students some new duties and responsibilities. Valid reasons for exceptions to this rule will be considered by the Department of Co-ordination. Additional work terms with co-operative organizations are a matter of mutual agreement between employers and students.

The student is required to prepare written reports which normally cover some phase of the employment during work terms. Such reports serve a dual purpose. Experience is gained in the preparation of written reports similar to those which an employer expects from a responsible employee. In addition, the necessity of gathering material for such a report will develop in the student a thorough appreciation for analysis. The work report is designed to help train the students to think, to organize and to express themselves on paper in a clear, logical and concise form. When possible it should be a project of benefit to the employer as well as the student. Work reports, a minimum of four in most programmes, are a requirement for graduation.

Evaluation
At the end of each work term, it is recommended that each student have an exit interview with the supervisor. During this interview, they should discuss together the student's work term performance using the "Employer's Evaluation of Co-operative Student" as a guide. For students in some programmes, this discussion may include the student's work report. The evaluation of the work report will be given by either the Department of Co-ordination or the Faculty. Both these evaluations (performance and work report) subsequently will be maintained in the student's record.

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

Conduct and Responsibilities
The satisfactory completion of co-operative work terms, a minimum of four in most programmes, is a requisite of graduation. It is emphasized that during the work terms the student carries a responsibility to build and maintain one's own good personal reputation as well as that of the University.

No student may continue in a co-operative programme at the University of Waterloo if acceptable progress is not achieved during the work terms. A student who fails to honour an agreement to work with an employer or who leaves the co-operative employment without prior approval from the Department of Co-ordination or whose conduct while on the job purposely causes dismissal, may be suspended immediately from the co-operative programme.

Unsatisfactory performance by a student in two
work terms will result in a thorough investigation of suitability for professional training and withdrawal from the programme may be required.

The foregoing has been written with the assistance of the Student Advisory Council to the Department of Co-ordination. 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.

Student Advisory Council to the Department of Co-ordination

The Student Advisory Council advises the Department of Co-ordination on matters of interest and policy from the students’ points of view. Members of Council also act as liaison between the student body and the Department. Council membership is by Society appointment as follows:

5 students Faculty of Engineering
2 students Faculty of Mathematics
2 students Faculty of Human Kinetics and Leisure Studies
1 student Department of Physics
1 student Department of Chemistry
1 student School of Architecture
1 student Department of Earth Sciences

Industrial Advisory Council for Co-operative Engineering and Applied Science

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

Mr. J.M. Lawrence
(Chairman)
B.P. Refinery Canada Ltd.
Mr. R.W. Scater
(Vice-Chairman)
The Giffels Group
Mr. D.W. Roughley
(Secretary)
The Corporation of the City of Hamilton

Mr. W. Bobbie
B.F. Goodrich Canada Ltd.
Mr. W.C. Bradbury
Westinghouse Canada Ltd.
Mr. C.C. Brown
The Price Co. Ltd.
Mr. R.A. Carlyle
International Nickel Co. of Canada Ltd.
Mr. R.C. Foss
MicroSystems International Ltd.
Mr. D. Friesen
Dofasco

Mr. A.S. Jones
Lubrizol of Canada Ltd.
Mr. B.D. Jones
Garlock of Canada Ltd.
Mr. T. Larson
Borden Chemical Co. (Canada) Ltd.
Dr. H.B. Marshall
Domtar Ltd.
Mr. C.C. Midwinter
Sandwell and Co. Ltd.
Mr. W.L. McDonald
Black and McDonald Limited
Mr. D. McKenzie
Ford Motor Company Canada Ltd.
Mr. H.A. Nightingale
Canada Post Office
Mr. K.H. Rapsey
Allen-Bradley Canada Ltd.
Mr. G. Roelofson
Montgomery Elevator Co. Ltd.
Mr. S.W. Sheldon
Standard Brands Ltd.
Mr. V. Skof
Frankel Structural Steel
Mr. A.E. Speers
Canadian National Railways
Mr. D.T. Stevenson
Babcock & Wilcox Canada Ltd.
Organizations Employing Co-operative Engineering and Applied Science Students

Abex Industries Limited
Abitibi Paper Company Limited
Abitibi Provincial Paper Limited
Aco Canadian Material Handling Systems
Acres Consulting Services Limited
The Adams Mine
Addiction Research Foundation
Aimco Industries Limited
Ainley and Associates Limited
Air Canada
Algoma Ore Division
The Algoma Steel Corporation, Limited
Allan Crawford Associates Limited
Allan C. Randles Limited
Allen-Bradley Canada Limited
Allied Chemical Canada Limited
Aluminum Company of Canada Limited
Aluminum Goods Limited
Anaconda Canada Limited
R.V. Anderson Associates Limited
Andrew Antenna Company Limited
Angelstone Limited
Anglo-Canadian Pulp & Paper Mills Limited
A P Parks Canada Limited
Applied Electronics Limited
Aquitaine Company of Canada Limited
Armalux Glass Industries Limited
Armbro Materials & Construction Limited
Armco Canada Limited
Associated Geotechnical Services Limited
Associated Tube Industries Limited
Astra Chemicals Limited
Atlas Steels Company
Atomic Energy of Canada Limited
The Austin Company Limited
Automotive Hardware Limited
B.A.C.M. Limited
Babcock & Wilcox Canada Limited
Bacon Engineering Limited
Baton Broadcasting Limited
Bauer Brothers Company (Canada) Limited
Bayly Engineering
T. W. Beak Consultants Limited
Beaver Engineering Limited
Bekaert Industrial Limited
Bell Canada
Bell-Northern Research
Benson & Hedges Tobacco Company
W.B. Bennett Paving & Materials Limited
Black & McDonald Limited
Borg-Warner (Canada) Limited
Borough of Etobicoke
Borough of Scarborough
J.P. Bowman Limited
Bradstock Reicher & Partners Limited
Brampton Hydro Electric Commission
Brant County Board of Education
Brantford Public Utilities Commission
Brinkerhoff Drilling Canada Limited
Bruce S. Evans Limited
B P Refinery Canada Limited
The Budd Automotive Company of Canada Limited
Building Products of Canada Limited
R.J. Burnside & Associates
Butler Manufacturing Company (Canada) Limited
Buhrs Magwood & Hall Limited
Canada Crushed Stone - Div. of Steetley Industries Ltd.
Canada Glue Company Limited
Canada Machinery Corporation, Limited
Canada Packers Limited
Canada Sand Papers Limited
Canadian Admiral Corporation Limited
Canadian Association of Oilwell Drilling Contractors
The Canadian Blower & Forge Company Limited
Canadian Blue Bird Coach Limited
Canadian Brass Limited
Canadian Broadcasting Corporation
Canadian Canners Limited
Canadian Carborundum Company Limited
Canadian Carbonization Research Association
Canadian Fram Limited
Canadian General Electric Company Limited
Canadian Gypsum Company Limited
Canadian Industries Limited
Canadian Johns-Manville Company Limited
Canadian National Railways
Canadian Pacific
Canadian Pittsburgh Industries Limited
Canadian Refractories Division
Canadian Stackpole Limited
Cadillac Development Corporation Limited
Canron Limited
E.G.M. Cape Company Limited
Capital Wire Cloth Limited
Carling O'Keefe Limited
Centerline (Windsor) Limited
Central Dynamics Limited
Chemetics International Limited
Chicago Rawhide Products Canada Limited
Chinook Chemicals Eastern Limited
Ciba-Geigy Canada Limited
Cimco Limited
City of Barrie
City of Brampton
City of Brantford
City of Brockville
City of Burlington
City of Cambridge
City of Chatham
City of Guelph
City of Hamilton
City of Kitchener
City of London
| City of Mississauga      | The Dominion Road Machinery Company Limited  |
| City of Niagara Falls   | Dominion Soil Investigations Limited        |
| City of Oshawa          | Domtar Chemicals Limited                    |
| City of Peterborough    | Domtar Construction Materials Limited       |
| City of Port Colborne   | Domtar Fine Papers Limited                  |
| City of Sault Ste. Marie| Domtar Limited                              |
| City of St. Thomas      | Domtar Packaging Limited                    |
| City of Sudbury         | J.T. Donald & Company                       |
| City of Thunder Bay     | Dorr-Oliver-Long Limited                    |
| City of Toronto         | Dow Chemical of Canada Limited              |
| City of Waterloo        | Dow-Corning Silicones Limited               |
| City of Welland         | Dresser Industries of Canada Limited        |
| Clarke & Lane, Consulting Engineers & O.L.S. | Dryden Paper Company Limited                |
| Clipsham Moreton Limited| Dufferin Construction Company               |
| Columbus McKinnon Limited| Dufferin Materials & Construction Limited   |
| Cominco Limited         | Dunker Construction Limited                 |
| Computing Devices of Canada Limited | Dunlop Canada Limited                     |
| Comstock International Limited | Dunlop Research Centre                   |
| Consolidated-Bathurst Limited | Duplate of Canada Limited                 |
| Consolidated Canadian Faraday Limited | Dupont of Canada Limited                  |
| Consolidated Computer Limited | Eaton Yale Limited                         |
| Conspec Controls Limited| Eastern Steel Products Limited             |
| The Consumer’s Gas Company | Ebasco Services of Canada Limited        |
| Consumers Glass Company Limited | Ecodyne Limited                         |
| V.B. Cook Company Limited | Ecstall Mining Company Limited            |
| Copeland Laboratories Limited | The E.B. Eddy Company                     |
| Corrosion Service Company Limited | Eddy Forest Products Limited              |
| Cosmos Chemlac Limited  | Edmund Newhall Associates Limited          |
| Coulter Copper & Brass Limited | J. Edward Lanthier, O.L.S.               |
| County of Brant         | R.A. Egan & Associates Limited             |
| CPI Vampco Limited      | Electric Reduction Company of Canada Limited|
| R.L. Crain Limited      | Electrohome Limited                        |
| Crane Canada Limited    | Electronic Associates of Canada Limited    |
| Crane Packing Company Limited | Electronics Corporation of America (Canada) Limited |
| Crouse-Hinds Company of Canada Limited | Ellis-Don Limited                      |
| Crystal & Latham, Consulting Engineers | El-Met Parts Limited                 |
| Cumming-Cockburn & Associates | The Engineering Group                  |
| Cyanamid of Canada Limited | Envirotech Canada Limited                 |
| Dagmar Construction Limited | Erie Technological Products of Canada Limited |
| Daisy Hedden Limited    | Ernst Leitz (Canada) Limited                |
| Dashwood Industries Limited | Esso Chemical Canada – A Division of Imperial Enterprises Limited |
| Dayco (Canada) Limited  | FAG Bearings Limited                       |
| Decca Radar Canada (1967) Limited | Falconbridge Nickel Mines Limited      |
| Decor Metal Products Limited | The Falk Corporation of Canada Limited    |
| De Laval Company Limited | Farley & King Limited                     |
| Deleuw, Cather, Canada Limited | Federal Pioneer Limited                 |
| Delta-Benco Cascade Limited | Ferrmar Paving Limited                |
| Denison Mines Limited   | Ferranti-Packard Limited                   |
| Diamond Clay Products Company Limited | Fiberglas Canada Limited               |
| Diesel Equipment Limited | Firestone Tire & Rubber Company of Canada Limited |
| Digital Methods Limited | Firth Brown Tools (Canada) Limited       |
| M.M. Dillon Limited     | Fischbach & Moore of Canada Limited        |
| Doehler Canada Limited  | Fisher Controls Company.of Canada Limited  |
| Dominion Aluminum Fabricating Limited | Flex Manufacturing Company           |
| Dominion Bridge Company Limited | FMC of Canada Limited                  |
| Dominion Chain Limited  | Forsythe Lubrication Associates Limited    |
| Dominion Foundries & Steel Limited | Foundation General Engineering Corporation Limited |
Foxboro Company Limited
Francis Hankin & Company Limited
Frankel Structural Steel Limited
Franklin Manufacturing Company of Canada Limited
Fruehauf Trailer Company of Canada Limited
Fullercon Limited
Funcraft Vehicles Limited
Galt Metal Industries Limited
Gamsby & Mannerow, Consulting Engineers
Gandalf Data Communications Limited
Garrett Manufacturing Limited
Gaspe Copper Mines, Limited
General Motors of Canada Limited
Geonics Limited
George Cluthe Manufacturing Company Limited
George Wimpey Canada Limited
The Giffels Group
Glaxo Canada Limited
H.Q. Golder & Associates Limited
B.F. Goodrich Canada Limited
The Goodyear Tire & Rubber Company of Canada Ltd.
Gore & Storrie Limited
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Department of Energy, Mines and Resources
Department of Indian Affairs and Northern Development
Department of National Defence
Department of National Health & Welfare
Department of Public Works
Department of Supply & Services
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Ministry of Transport
National Energy Board
National Research Council
Post Office Department
Government of Ontario
Ministry of Colleges & Universities
Ministry of Consumer and Commercial Relations
Ministry of the Environment
Ministry of Government Services
Ministry of Natural Resources
Ministry of the Solicitor General
Ministry of Transportation & Communications
Ministry of Treasury, Economics & Intergovernmental Affairs
Grand River Conservation Authority
G. Granek & Associates
Grandview Industries Limited
Grayco Limited
Great Canadian Oil Sands Limited
The Great Lakes Paper Company Limited
Great Northern Capitol Corporation Limited
Great West Steel Industries Limited
Greb Industries Limited
A.P. Green Refractories (Canada) Limited
The Griffith Laboratories Limited
GSW Research Centre
GTE Automatic Electric (Canada) Limited
Guelph Hydro
Gulf Oil Canada Limited
Haessler & Deway Limited
A.C. Hamilton & Company
Hamilton Harbour Commission
Hamilton Hydro-Electric System
Hammond International (Canada) Limited
Hart Chemicals Limited
Hatch Associates Limited
Hayes-Dana Limited
Hi-Test Instruments Limited
Holderbank Technical Services Limited
Holek-Vollmer Limited
Holstead & Orendorff, O.L.S.
Honeywell Controls Limited
The Hoover Company Limited
Horton CBI Limited
Hospital for Sick Children, Toronto
Hostess Foods Products Limited
Hudson Bay Exploration & Development Co. Limited
Husky Floor Machine Company Limited
Hussmann Food Store Equipment Limited
Hydraulic Machinery Company Limited
Hydro Mississauga
Hy-Hoe Corporation Limited
IBM Canada Limited
ICN-Empire – Division of ICN Canada Limited
Imperial Oil Enterprises Limited
Imperial Tobacco Company (Ontario) Limited
Imperial Tobacco Products Limited
Induco Consultants of Canada Limited
Indusmin Limited
Ingersoll Public Utilities Commission
Inglis Company Limited
Inspec-Sol Limited
The International Nickel Co. of Canada Limited
International Syscoms Limited
Interroyal Corporation Limited
Intra-Space International, Inc.
Iron Ore Company of Canada
ITT Canada Limited
James F. MacLaren Limited
Jaro Manufacturing Company Limited
Jerrold – A Division of General Instrument of Canada Limited
John Deere Welland Works
John T. Hepburn Company Limited
John C. Parkin Architects
Johnson Matthey & Mallory Limited
S.C. Johnson and Sons, Limited
Joiner Homes Limited
Jones Kirwan Associates Limited
Joseph E. Seagram & Sons Limited
Joy Manufacturing Company (Canada) Limited
Kanmet Limited
Kaufman Footwear Limited
Kearney - National (Canada) Limited
Kerr Addison Mines Limited
Kilborn Engineering Limited
Kimberly-Clark of Canada Limited
Kenting Earth Sciences Limited
K.H. King Associates Limited
King Hydraulic Power Limited
R.S. Kirkup & Son
Kitchener-Waterloo Hospital
The Kleinfeldt Group Limited
Koehring-Waterous Limited
H.J. Koester Limited
Kovery Construction Company Limited
Labatt Breweries of Canada Limited
Lackie Bros. Limited
LaFontaine, Cowie, Buratto & Associates
Lakefield Research of Canada Limited
Laura Secord Candy Shops Limited
Lear-Siegler Industries Limited
Leco Industries Limited
J.D. Lee Engineering Limited
Leigh Instruments Limited
Lindsay CATV System Limited
Litto Systems (Canada) Limited
Lloyd-Truax Limited
M. Loeb Limited
W.P. London and Associates Limited
Looby Construction Limited
Lubrizol of Canada Limited
The Lummus Company Canada Limited
Lumonics Research Limited
Lunar Company Limited
3M Canada Limited
M & I Products of Canada Limited
MacLean Hunter Cable T.V. Limited
MacMillan Bloedel Limited
Maksytec Associates Limited
Malcolm Condensing Company Limited
Manitoba Forestry Resources Limited
Manitoba Hydro Limited
Mansfield-Denman General Limited
Marshall Macklin Monaghan, O.L.S.
Marshall Engineering Limited
V.K. Mason Construction Limited
Mattagami Lake Mines Limited
Mattabi Mines Limited
Mathews Conveyor Company Limited
Matthews Group Limited
Maxim Electrical Construction Company Limited
McAsphalt Industries Limited
McConnel & Mitsche
McCormick Rankin & Associates Limited
H.J. McFarland Construction Company Limited
McGeorge & Barry Limited
McGrath Engineering Limited
McKee Brothers Limited
McNamara Marine Limited
McLean Foundry Limited
Metex Corporation Limited
Mickelson Associates
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Miehle-Goss-Dexter Americas Company
Millhaven Fibres Limited
The Mitchell Construction Company (Canada) Limited
Molson's Brewery Limited
Monteil Ingram Engineering Limited
Montgomery Elevator Limited
Montreal Engineering Company Limited
Motor Wheel Industries (Chatham) Limited
Motorola Electronics Sales Limited
Mountain Cablevision Limited
MTD Products Canada
Municipality of Metro Toronto
The National Cash Register Company of Canada Ltd.
Nelco (Kitchener) Limited
New Dundee Cooperative Creamery
Nisbet, Letham Limited
Noranda Mines Limited
Noranda Research Centre
Northern Electric Company Limited
Northland Engineering Limited
North York Hydro Office
Norwich Pharmaceutical Company Limited
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Oakville Public Utilities Commission
The Ontario Cancer Institute
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Ontario Malleable Iron Company Limited
The Ontario-Minnesota Pulp and Paper Company Ltd.
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Ontario Research Foundation
Ontario Transportation Development Corporation
Ottawa Construction Management Services
Otis Elevator Company Limited
Ottawa Gas
Outboard Marine Corporation of Canada Limited
Oxford Mental Health Centre
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Data Crown Limited
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Eddy Forest Products Limited
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Ellis-Don Limited
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Ford Motor Company of Canada Limited
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Gardner, McDonald & Company
Gates Rubber of Canada Limited
GEAC Computer Corporation Limited
The General Accident Assurance Company of Canada
General Foods Limited
General Motors Canada Limited
George A. Welch & Company
Gerling Global Life Insurance Company
Glendinning, Jarrett, Gould & Company
The Globe and Mail Limited
B.F.Goodrich Canada Limited
Gore Mutual Insurance Company
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Department of Indian Affairs and Northern Develop.
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Department of Manpower and Immigration
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Department of National Health & Welfare
Department of Regional Economic Expansion
Department of Supply and Services
National Energy Board
National Research Council
Post Office Department
Public Service Commission
Revenue Canada – Taxation
Revenue Canada – Customs & Excise
Statistics Canada
Unemployment Insurance Commission
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Ministry of Government Services
Ministry of Health
Ministry of Revenue
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Gray, Butcher, Frost & Company
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M.A. Hassel
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Hiram Walker & Sons Limited
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Imperial Life Assurance Company Limited
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Informetrica Limited
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The International Nickel Company of Canada Limited
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John Labatt Limited
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Joselyn, Laughlin, Harper, Tory & Associates
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Langlois, Hauck & Company
Laventhal, Krekstein, Horwath & Horwath
M. Loeb Limited
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London Life Insurance Company
3M of Canada
MacGillivray & Company
A.F. MacLaren & Company
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Maritime Life Assurance Company
McCay, Duff & Company
McColl, Turner & Company
McKerlie Automotive Limited
McMahon, Millard, Graham & Kentner
The Merchantile & General Reinsurance Company
Millard, Rouse & Rosebrugh
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Molson Industries Limited
Moore & Company
Morris, Burk, Friedman & Luborsky
Multiple Access Limited
Municipality of Metropolitan Toronto
Murphy, Murphy & Wells
The Mutual Life Assurance Company of Canada
National Data Centre
The National Life Assurance Company of Canada
Neil Coburn
New Brunswick Telephone Company
Noranda Mines Limited
North American Life Assurance Company
Northern & Central Gas Corporation Limited
Ontario Credit Union League Limited
The Ontario Institute for Studies in Education
Ontario Hydro
Osborne & Osborne
Outboard Marine Corporation of Canada Limited
Peat, Marwick, Mitchell & Company
Perlmuter, Orenstein, Giddens, Newman & Company
Phillips Electronics Industries Limited
Polycom Systems Limited
Polysar Limited
Price-Waterhouse & Company
Procter & Gamble Company of Canada Limited
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QL Systems Limited
Riddell, Stead & Company
Robertshaw Controls (Canada) Limited
Ross, Pope & Company
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Royal Insurance Group
Saddington, Greenfield & Company
J.M. Schneider Limited
Scholar’s Choice Limited
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I.P. Sharp Associates Limited
Shell Canada Limited
Simpsons-Sears Limited
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Software House Limited
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Springer Chapman & Company
The Steel Company of Canada Limited
Sun Oil Company Limited

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Tessier, Smith & Partners
Texaco Canada Limited
Thorne Gunn & Company
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Toronto Hydro -- Electric System
The Toronto Mutual Life Insurance Company
Toronto Transit Commission
Touche, Ross & Company
Towers Department Stores Limited
Towers, Perrin, Forster, Crosby (Canada) Limited
Trans Canada Pipe Lines
Travelers Life Insurance Company of Canada
Union Gas Company of Canada Limited
Unionmutual Life Insurance Company
United Co-operatives of Ontario
United Investment Services Limited
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Ashbury College
Bishop’s College School
Loyalist College of Applied Arts & Technology
Ryerson Polytechnical Institute
St. Clair College
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Air Canada
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Architects for Metro Centre
Arcop Associates
Arthur Erickson – Architect
Buzemore Architecture & Planning
Bell Canada
Boigon & Armstrong Architects
Ray & Elizabeth Bradbury
Bregman & Hamann, Architects
Brook, Carruthers, Shaw Architects
R.V.B. Burgoyne, Architects
Central Mortgage & Housing Corp.
Clifford & Lawrie Architects
Crang & Boake, Architects
Dale & Scott, Architects
deBel ete & Koffman, Architects
Design Research Consultants
Diamond & Myers Architects
Dickson/Ventin Architects
D. Dimakopoulos, Architect
Dunlop Farrow Aitken
E.L.B. Associates Inc.
Henry Fliess Architect
The Giffels Group
Gore & Storrie – Engineers
Govan Kaminker Langley
Keenleyside Melick
Government of Canada
   Department of National Health and Welfare
   Department of Public Works
   Ministry of Transport
   National Capital Commission
   National Research Council
Government of Ontario
   Ministry of Colleges and Universities
   Ministry of Community and Social Services
   Ministry of Correctional Services
   Ministry of Government Services
   Ministry of Natural Resources
Hallford & Wilson Architects
Halton Region Conservation Authority
Hamilton Conservation Authority
Don Hancock Landscape Architect
Imperial Oil Ltd.
Innovation Four Design
Jackson Ypes & Associates
Thomas P. Kalman, Architect
William C. Karleff, Architect
William E. Keenan, Architect
Keith Little Associates Ltd.
Kettle Creek Conservation Authority
James W. Keywan, Architect
Erdmann W. Knaack, Architect
Kyles, Kyles & Garratt Architects
Lebensold, Affleck, Nichol, Hughes
Lipson & Dashkin, Architects
London Board of Education
Long Point Conservation Authority
Ludlow & Fleury Architect
Jerome Markson Architect
V.K. Mason Construction Ltd.
McGrath Engineering Ltd.
A. Norman McRoberts Architect
C. Blakeway Millar Architect
Ministry of Education (Barbados)
Town of Mississauga
Moffet & Duncan, Architects
W.H. Nesbitt, Architect
Nicol Schoales Ream McBain Architects
Nightingle & Quigley Architects
Northern College of Applied Arts
Ogus & Fisher Architects
Owen Luder Partnership
Page & Steel Architects
Parkin – Architects
Prack & Prack Architects
Quadric Ltd.
Ranta & Tett Architects
Renton Howard Wood Assoc.
E.I. Richmond, Architect
Robinson & Heinrichs
Sheldon D. Rosen, Architect
Ryan & Lee
Salter & Allison Architects
Sankey Associates
Scherrer & Hicks
Searle Wilbee Rowland Architects
Sifton Properties
R. Stewar Smith, Architect
Stevens & Skinner Architects
Snider Huget & March Architects
Joseph W. Storey, Architect
Swain & Rupnow Consulting Engineers
Sydenham Valley Conservation Authority
S D L Systems Research Group
The R.J. Thom Partnership
Toronto Transit Commission
Ferdinand Wagner Architect
Wing's Success Ltd.
Y & R Properties
Organizations Employing Co-operative Kinesiology and Recreation Students

Boards of Education
- Metropolitan Separate School Board, Toronto
- Ottawa Board of Education
- Peel Board of Education
- Renfrew Board of Education
- Timmins Board of Education
- Waterloo County Board of Education
- Wellington County Board of Education
- York County Board of Education

Children's Psychiatric Research Institute, London
Dominion Foundries & Steel Limited
Dr. MacKinnon Phillips Hospital, Owen Sound
Elliot Lake Centre for Continuing Education
Family Services Association, Toronto
Fern Resort, Atherley
The Fitness Institute, Willowdale
Goderich Psychiatric Hospital
Government of Northwest Territories
Government of Ontario
- Ministry of Community and Social Services
- Ministry of Correctional Services

Hamilton Psychiatric Hospital
C.M. Hincks Treatment Centre, Toronto
Huronia Regional Centre, Toronto
Huronia Regional Centre, Orillia
Kettle Creek Conservation Authority, St. Thomas
Kingston Psychiatric Hospital
Lakehead Psychiatric Hospital, Thunder Bay
Lakeshore Psychiatric Hospital, Toronto
Linhaven Home for the Aged, St. Catharines
Lutherwood, Waterloo
Maitland Valley Conservation Authority, Wroxeter
Mental Health Centre, Penetanguishene
Merrymount Children's Home, London
Midwestern Regional Centre, Palmerston
Montreal Association for the Blind
Muskoka Centre, Gravenhurst
Ontario Association for the Mentally Retarded, Toronto
Ontario Crippled Children's Centre, Toronto
Ontario Housing Corporation, Toronto
Ontario Police College, Aylmer
The Orthopaedic & Arthritic Hospital, Toronto
Oxford Regional Centre, Woodstock
Participation House, Markham
Parks Canada
Parks, Recreation & Community Centre Board, Wallaceburg
Pine Ridge, Aurora
Prince Edward Heights Hospital, Picton
Queen Street Mental Health Centre, Toronto
Quinton Instruments
Regional Municipality of Niagara, Homes for the Aged, Welland
Rideau Regional Hospital School, Smiths Falls
Riordan Sporting Goods

Simcoe Hall Boys' Club, Oshawa
Skyline Hotel, Toronto
Souris Valley Extended Care Hospital, Weyburn, Sask.
Southwestern Regional Centre, Blenheim
St. Clair Region Conservation Authority, Strathroy
St. John's School, Uxbridge
St. Thomas Psychiatric Hospital
Sunnybrook Hospital, Toronto
Town of Ingersoll
Town of Newmarket
Town of Stoney Creek
Township of Nepean

Universities and Colleges
- Conestoga College of Applied Arts and Technology
- Sault College of Applied Arts and Technology
- Trent University

Valleyview Home for the Aged, St. Thomas
Waterloo Tennis Club
West Scarborough Boys' Club
Whitby Psychiatric Hospital
Wilmot Recreation Department, Baden
Woolwich Recreation Department, Elmira

YMCA -
- Ottawa
- Hamilton
- Kitchener-Waterloo
- Metropolitan Toronto
- Storer Camps

YWCA -
- Ottawa
- Metropolitan Toronto
Students at all academic levels are assisted by this Department in determining careers paths and in obtaining employment on graduation. Types of employment and the organizations and agencies compatible with the individual student's needs and abilities are discussed during personal interviews with Career Counsellors.

Group sessions for students are held on job hunting techniques, resume writing, how to take an interview, how to evaluate an employer and how performance appraisal systems work. These sessions help bridge the gap between the academic environment and the search for employment.

Through the Department students have access to a wide range of career information. This includes general employment trends, starting salary levels, opportunities in various fields, and with specific employers. Literature is available covering the characteristics of all classifications of employment and describing the operations and normal requirements for university graduates of individual employers.

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 post-graduate students, participate in a three week interview period in November-December and also in January interviews.

The Department strives to give the best possible service by opening as many communication channels as possible among students, employers, faculty and staff, relative to career planning and placement.

The Career Planning and Placement Offices are located on the first floor of the Ira G. Needles Hall.
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<td>P. Stoksik, B.A., B.L.S. (Toronto)</td>
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<td><strong>Cataloguers</strong></td>
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<tr>
<td>T. Canini, B.A., M.A. (Helsinki), M.L.S. (Western)</td>
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<td>A. Chan, B.A. (Hong Kong), M.L.S. (Western)</td>
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<td>C. Hagstrom, B.A. (Lakehead), M.A. (Western), M.L.S. (Western)</td>
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<td>R. Ho, B.A. (Wisconsin-Madison), M.S.L.S. (Case Western)</td>
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<td>G. Raaphorst, B.A. (Ottawa), M.L.S. (McGill)</td>
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<td>M. Wan, B.Sc. (Hong Kong), M.A., M.L.S. (Western)</td>
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<tr>
<td><strong>Government Publications Department Head</strong></td>
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<tr>
<td>C. Presser, A.B. (Hunter), M.L.S. (Pratt)</td>
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<tr>
<td><strong>Librarian</strong></td>
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<tr>
<td>J. Boettger, B.A. (Waterloo), B.L.S. (British Columbia)</td>
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<tr>
<td><strong>Serials Department Head</strong></td>
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<tr>
<td>B. Bruder, B.A. (Waterloo Lutheran)</td>
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<td><strong>Cataloguer</strong></td>
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<td>G. Louden, B.A. (Temple), M.L.S. (Toronto)</td>
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<td><strong>Arts Library</strong></td>
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<tr>
<td>Assistant Librarian</td>
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<tr>
<td>B. MacNeil, B.Sc. (Laurentian), M.L.S. (McGill)</td>
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<tr>
<td><strong>Circulation Department Head</strong></td>
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<tr>
<td>E. Reaman, B.A. (McMaster), B.L.S. (Toronto)</td>
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<tr>
<td><strong>Reference Department Head</strong></td>
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<tr>
<td>T. Eadie, B.A. (Queen's), M.A. (Queen's), M.L.S. (Western)</td>
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<tr>
<td><strong>Reference Librarians</strong></td>
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<tr>
<td>L. Black, B.A. (Waterloo College), B.L.S., M.L.S. (Toronto)</td>
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<tr>
<td>M. Blok, B.A. (Waterloo), M.L.S. (Western)</td>
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<tr>
<td>R. Crusz, B.A. (Ceylon), M.A. (Waterloo), B.L.S. (Toronto)</td>
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<td>G. Meek, B.A. (McMaster), M.A. (Western), M.L.S. (Western)</td>
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<tr>
<td>A. Slade, B.A. (Victoria), B.L.S. (British Columbia)</td>
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<tr>
<td><strong>Engineering, Mathematics and Science Divisional Library Head</strong></td>
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<tr>
<td>A. Berti, B.A. (Windsor), B.L.S. (Toronto)</td>
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<tr>
<td><strong>Circulation Department Head</strong></td>
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<td>V. Mixer, A.B. (Hanover)</td>
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<td><strong>Assistant Head</strong></td>
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<tr>
<td>S. Beuttenmiller, B.Sc. (Waterloo), B.L.S. (Toronto)</td>
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<td><strong>Reference Librarians</strong></td>
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<tr>
<td>G. Birks, B.Sc. (Manitoba), B.L.S. (Alberta)</td>
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<tr>
<td>W. Macpherson, B.Sc., M.L.S. (Dalhousie)</td>
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<tr>
<td>H. Mayoh, B.A. (British Columbia), M.A. (Toronto), B.L.S. (Alberta)</td>
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<tr>
<td>D. Morton, B.Sc. (Western), M.L.S. (Western)</td>
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<tr>
<td>J. Parrott, B.Sc. (Queen's), M.Sc., B.L.S. (Toronto)</td>
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<tr>
<td>B. Toth, B.A. (Queen's), M.L.S. (McGill)</td>
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<tr>
<td><strong>Environmental Studies Library Head</strong></td>
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<tr>
<td>P. Brown, B.A. (Queen's), M.L.S. (Toronto)</td>
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<tr>
<td><strong>Administrative Services Systems Development Librarian</strong></td>
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<tr>
<td>G. Damon, B.A. (Maine), M.S.L.S. (Case Western)</td>
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<tr>
<td><strong>Budgets Officer</strong></td>
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<tr>
<td>J. Jorgensen, B.A. (Toronto)</td>
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</table>
The University Libraries are central to the academic programmes going on throughout the University. Their function is to provide books, journals, and other library materials to support those programmes. The library staff, aided by the university community in many important ways, works to make the library system an excellent base for teaching, study and research.

The Dana Porter Arts Library, situated in the centre of the campus and rising to a height of ten storeys, is the focal point of the University. The lower floors house the main public service departments and the behind-the-scenes technical services. From just inside the main entrance on the second floor the public catalogue, the circulation counter and the reference desk are all immediately visible and close at hand. The periodical and journal collections, microforms, and sound recordings are located on the third floor. The reserve book and journal area, including both the reserve collection and a reading room, is on the fourth floor. Government publications are located on the fifth floor. The upper floors house the main circulating collections and seats for readers. In all there are more than fourteen hundred places for readers.

The Arts Library collections number 500,000 volumes of books and periodicals in the Humanities and Social Sciences, plus pamphlets, theses, microforms, documents, reports, sound recordings, and other materials. The library grows by 4,000 volumes each month. An important element is the collection of journals and periodicals, back files and current issues. The library has 4,000 subscriptions to current titles.

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

The E.M.S. Library collections number 185,000 volumes of books and journals, plus many kinds of special materials, including technical reports, microforms, documents and maps. The library has 3,000 subscriptions to current periodicals; 18,000 volumes of books and periodicals are added per month.

The Environmental Studies Library is housed on the main floor of the Social Sciences Building. The core of the library collection consists of 35,000 maps, supported by 3,300 books and reports, together with atlases, periodicals, aerial photographs and films. Like the Arts and E.M.S. libraries, its resources are available to all members of the University.

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

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

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

10 Faculty of Engineering
11 Faculty of Human Kinetics and Leisure Studies
12 Integrated Studies
13 Inter-Faculty Studies
14 Faculty of Mathematics
15 Faculty of Science
Faculty of Arts
Students receive instruction on aspects of printing processes.
The Faculty of Arts

Technological skills and resources are needed to solve — at least manage — the myriad perplexing problems that face mankind during the closing years of the Twentieth Century. Equally necessary, perhaps more necessary, are the skills and resources provided by the traditional disciplines that study that curious creature man. It is precisely this curious creature that one studies in the humanities and social sciences comprising the various Arts curricula: man and his history and his art, literature, languages; man and his political and social institutions; man and his philosophical and theological and ethical systems; man and his cities, nations, wars; man as a consumer, buyer, seller, trader; man as a thinker, a creator, a destroyer; man as a hermit, man as a social creature; man and his behaviour.

In addition to the public role of the Arts is the private and inner dimension. University students come to university expecting that their main concern will be to prepare themselves to make a living. They should also concern themselves about the business of living. Unless there are some inner resources, some disciplined, creative and liberated imaginative faculties trained to go to work, a person is not going to explore fully the business of living.

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

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

Pass Programme
The General Programme in Arts (Page 84).

Honours Programmes
The Faculty of Arts offers Honours degrees in the following major disciplines: Anthropology, Classical Studies, Economics, English, Drama and Theatre Arts, Fine Arts (Art), French, Geography, German, History, Latin, Medieval Studies, Philosophy, Political Science, Psychology, Religious Studies, Russian, Sociology, Spanish An Honours Programme in Social Development Studies has been approved, and will be offered in September 1975. Joint honours programmes combining any two of the above noted Arts disciplines or combining an Arts discipline with a programme in another faculty are available. Students should cater to their individual interests in selecting a particular programme. Descriptions of the single honours programmes and each discipline's requirements in joint honours programmes are outlined on pages 86 through 103. Students interested in programmes and courses emphasizing Canadian material should examine the Canadian Studies programme on page 87 and the Canadian Studies section of the Calendar, in Chapter 16.

Type A Teaching Certification
Admission to the Type A Certification programme at the Ontario Colleges of Education requires the completion of a programme of at least twenty full-year University courses, including one or two specialist fields in which the student has obtained at least second class (honours) or equivalent standing. A programme of twenty courses and one specialist field must include at least nine full courses in the field. A programme of twenty courses and two specialist fields must include fourteen full-year courses in the two combined fields, with at least six in each field. The Ontario Ministry of Education approved specialist fields are as follows: Agriculture, Anglais, Art, Biology, Chemistry, Computer Science, Drama or Theatre Arts, Economics, English, Francais, French, Geography, Geology, German, Greek, History, Home Economics, Italian, Latin, Mathematics, Music, Physical and Health Education, Physics, Political Science, Psychology, Russian, Sociology, Spanish.

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

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

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

Students transferring from Faculties within the University, or former University of Waterloo students
returning after an absence, generally have the option of either transferring previous UW courses with 60% (C) or better without including these in the cumulative average or transferring all relevant courses passed and including all courses passed and failed in the cumulative average.

Registration
September 2, 3, 4, 5, 1975.

Fees
Refer to Section 3 page 29.

Examinations and Standings

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

Students should note that the Faculty of Arts operates under a course system in which student progress is measured by courses successfully completed rather than by years. Students who have passed fewer than five courses will be considered Year 1 students; those who have passed at least five courses but fewer than ten will be considered Year 2 students; those with at least ten but fewer than fifteen, Year 3, and those with 15 or more, Year 4.

1 Final Examinations

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

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

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

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

2 Grading System

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

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

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

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

Note

When a failed course is repeated, the two marks are not averaged together. Rather both marks are entered with all other marks in calculating the student's cumulative overall average.

d) Students may request that their performance in any given Arts course be marked either as Credit (Cr) or Fail (F). The instructor of the course and the student's department must agree to this arrangement at the outset of the course and the student must communicate the decision in writing to the Arts Faculty Examinations and Standings Committee before the end of the three week drop and add period. In satisfaction of the minimum degree requirements students in general programmes may present up to three full course equivalents with a grade of Credit (Cr) in courses outside their major. Students in Honours Programmes may present up to four full course equivalents with a grade of Credit (Cr) in courses outside their Honours Area.

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

An incomplete "INC" may be assigned by an instructor in exceptional circumstances, with the consent of his Department. This extension of completion date is granted to students as a privilege for a limited and specified time and in normal circumstances shall be no longer than three months for a half-course and seven months for a full course.
Note
Students should make themselves familiar with the internal procedures established by their major Department in handling incomplete courses. This is particularly important in that a student with outstanding Incompletes on his record will be given Conditional Standing and will not be able to graduate until the "INC" has been replaced by a letter grade.

3 Course Load
A regular, full-time student in the General Arts Programme usually, in each academic year, enrols in five courses, but may enrol in as many as six.

A regular student in the Honours Arts Programme enrols in at least five or six courses (see departmental Honours programmes for specification and exceptions). Students in Honours programmes may not enrol in more than one course in excess of the number specified for their programme.

4 Reduced Programmes
Students may be enrolled for reduced programmes and may take fewer than five courses. Such programmes must be elected at pre-registration or during the official drop-add periods and must be consistent with the drop-add regulations outlined on page 85. After these times reduced programmes require the approval of the appropriate Undergraduate Office, and of the Examinations and Standings Committee, and they must be consistent with the drop-add regulations.

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

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

b) To be considered in good standing in the Honours programme, a student must maintain a cumulative overall average of at least 60% as well as an average of at least 75% in the individual’s field of specialization (unless otherwise specified in a departmental Honours programme). If an Honours degree candidate’s major average falls below the prescribed minimum, such candidate will be considered for the General degree and the regulations in (a) above will apply. If, subsequently the student raises his average to the required level, he may, through his Department Chairman, petition the Examinations and Standings Committee to review his case. (See Note below.)

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

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

d) A student who has been required to withdraw for academic reasons is eligible to apply for readmission after one year’s absence. If re-admitted, such a student will retain credit for previous passed courses, and will have a cleared average.

7 Appeals
Appeals against faculty decisions (whether dealing with grades or with the application of any faculty rules) made under these regulations may be made in writing to the Examinations and Standings Committee of the Arts Faculty Council.

Students wishing to appeal a grade, should first try to work the matter out with the instructor concerned. If a mutually acceptable decision cannot be worked out between the student and the instructor, the student should next petition the Arts Faculty Examinations and Standings Committee, requesting a departmental review of the matter. The manner of such review is determined by each department; the results will be sent to the Examinations and Standings Committee; the Committee will notify the student and the instructor of the results.

Either the student or the instructor may, within two weeks of the receipt of the result, appeal the departmental decision to the Examinations and Standings Committee for further review; the Committee will notify the student and the instructor of its decision.

Either the student or the instructor may, within two weeks of the receipt of the result, make yet a further appeal through the Examinations and Standings Committee. The Examinations and Standings Committee will forward the request and all appropriate material to the Arts Faculty Executive Committee which has the right to refuse to hear the appeal. If the Executive Committee accepts the appeal, the
Chairman of the Arts Faculty Executive Committee forwards the appeal to the Chairman of the Arts Faculty Council. The Chairman of Council asks the student and the instructor each to name one person to serve as reviewers. According to guidelines approved by the Arts Faculty, the two persons named select a third person to serve with them as a review committee. The committee of three determines the manner in which it will review the case. The appeal is determined by a majority decision and is final and binding upon all parties. The Chairman of the Arts Faculty Council transmits the decision and pertinent information to the Arts Faculty Examinations and Standings Committee; the Examinations and Standings Committee will notify the students and instructor of the results.

The General Programme

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

Group A and Group B Requirements

All Arts students in all Arts Major and Honours Programmes (see below for requirements for non-majors) must meet the Faculty of Arts Group A and B requirements. Group A comprises courses in the humanities, and Group B comprises courses in the social sciences:

| Group A (i) | English, History, Philosophy |
| Group A (ii) | French, German, Greek, Italian, Latin, Russian, Spanish, Ukrainian (see Note) |
| Group A (iii) | Drama, Fine Arts, Religious Studies |
| Group B | Anthropology, Economics, Geography, Political Science, Psychology, Sociology |

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

Note 1
Other foreign languages may be used to meet the Group A (ii) requirement. This includes such courses as Religious Studies 1051 Elementary Hebrew, Religious Studies 106P New Testament Greek, Arts 190*/191* Introductory Chinese, Arts 290*/291* Intermediate Chinese.

Note 2
Arts students should note that they may elect to meet the Group A (ii) requirement in their second or subsequent year by completing with passing marks one of the following courses: French 291*/292*; German 271*/272*; Russian 271*/272*; Spanish 210; Classical Civilization 201*/202* or Italian 2301. These courses are not open to first year Arts students. These courses are the only approved alternatives to the A (ii) requirements.

Selection of Year 1 Programmes

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

Students thinking of the Honours Programme should generally follow the recommended first year programmes outlined in the Calendar beginning on page 86. These are recommendations only (which general students may also follow if they wish), but various substitutions and adjustments may be made to suit a student's special needs or interests.

A full time student will normally sign up for five courses. The student should be careful to select introductory courses in subjects in which the student might major or do an honours programme. A student is free to choose any course in the university for which prerequisites have been met. Students may choose courses from Group A and B; courses in Mathematics, in Science, in Human Kinetics and Leisure Studies or in Environmental Studies.

Usually, a first year student is encouraged to take five courses in different fields so that the individual has a broad exploratory base from which to mount the second year programme. There is ample opportunity for specialization in subsequent years. Usually, if marks meet the necessary minima, an Arts student can move into almost any second year programme in the Arts Faculty. Often a student is able to transfer to second year programmes in other faculties. The Faculty of
Arts has no required course in any particular subject in the first year.

A student who has not determined the field or subject of concentration should study the Calendar carefully. After examining the suggested departmental programmes, the student should read the descriptions of separate courses in order to have a more comprehensive idea of what the content of any programme would include. A student should consult the School Guidance Officer, the chairman of any University department, or the office of the Dean of Arts by letter or in person for additional clarification and information.

Note 1
Space limitations may, from time to time, imply that students admitted to the University or otherwise in good standing, are not guaranteed course and programme selections of their choice.

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

Note 3
In Year 1, a student must normally complete the introductory course in the department in which he will major in later years.

Note 4
Courses refers to courses which extend for one full academic year (September through April). Two half-year (term) courses are the equivalent of one full course; half (term) courses are marked with * in the course description section.

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 or dropped 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.
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.
e) Students in the Arts Faculty at the University of Waterloo may enrol in reduced programmes and may take less than five courses. Such programmes must be elected at pre-registration or during the official drop-add periods and must be consistent with the drop-add regulations outlined in (b) and (c) above. After these times reduced programmes require the approval of the Dean of Arts or of the Chairman of one of the departments (depending upon the status of the student), and of the Examinations and Standings Committee and must be consistent with the drop-add regulations.
f) A course that has not been dropped officially (i.e. recorded in the Registrar's Office) will receive a grade and be counted in the student's average.

Year 1
Students in Year 1 choose at least five courses, usually two from Group A and two from Group B, with one or two more as electives. At the end of Year 1, students in the General major Programme must choose one of the following subjects as their major field of study:

<table>
<thead>
<tr>
<th>Anthropology</th>
<th>Human Relations</th>
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<tbody>
<tr>
<td>Classical Civilization</td>
<td>Latin</td>
</tr>
<tr>
<td>Drama</td>
<td>Medieval Studies</td>
</tr>
<tr>
<td>Economics</td>
<td>Philosophy</td>
</tr>
<tr>
<td>English</td>
<td>Political Science</td>
</tr>
<tr>
<td>Fine Arts (Art)</td>
<td>Psychology</td>
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<tr>
<td>Fine Arts (Music)</td>
<td>Religious Studies</td>
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<td>French</td>
<td>Russian</td>
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<td>Geography</td>
<td>Social Development</td>
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<td>History</td>
<td>Spanish</td>
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<tr>
<td>History</td>
<td>Spanish</td>
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</tbody>
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Year 2
Students in Year 2 of the General Programme choose at least five courses in consultation with their departmental advisor:
a) a minimum of two further courses in the major subject (See notes);
b) three other courses (See notes).

Year 3
Students in Year 3 must choose five courses in consultation with their departmental advisor:
a) a minimum of two further courses in the major subject;
b) three other courses.
Note 1
The programme of every student in the General Programme must include either:
a) a minimum of eight courses beyond the 100 level, or
b) courses from no more than seven subject fields.

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

Non-Major General Arts Programme

a) A student in the Arts Faculty may graduate with a general Arts degree (non-major) upon completion of 15 courses with a passing mark in each, including:
   a minimum of 7.5 courses, above the first year level;
   a minimum of 7.5 courses in the Faculty of Arts;
   a minimum of two courses, not both in the same subject from among English, History, Philosophy, Fine Arts, Religious Studies, and languages other than English;
   a minimum of two courses, not both in the same subject, from among Anthropology, Economics, Geography, Political Science, Psychology and Sociology.
   b) A cumulative average of 65% is required for graduation.

Note
Any normal first year Arts programme will satisfy the needs for a student contemplating a General Arts (non-major) programme. The programmes of Non-Major General Arts students must be arranged through the Arts Faculty Undergraduate Office.

Minor Programmes
Students in other faculties may elect a minor in an Arts discipline. Minor requirements are specified in the respective Departmental listings beginning with Chapter 16.

Honours Programmes

In Year 1 a student must normally complete the introductory course in the subject in which such student will major in later years. Before graduation each student must have completed twenty to twenty-four courses, (as specified in a Departmental Honours Programme) with a passing mark in each.
Students are requested to refer to the detailed programmes following this page for the other departmental requirements. Joint Honours Programmes not found in this section may be arranged by consultation between the student and the departments concerned.

Honours Anthropology
The students programme must include a year (two half course equivalents) of Archaeology
Linguistics
Social-cultural Anthropology
Physical Anthropology
Honours theory (theory oriented courses at the 400 level

Year 1
Recommended Programme
Anthropology 101*/102*
Four electives

Year 2
Three full courses (or half course equivalents) in Anthropology.
Two electives

Year 3
Three full courses (or half course equivalents) in Anthropology.
Two electives

Year 4
Three full courses (or half course equivalents) in Anthropology.
Two electives.

Anthropology Joint Honours Programmes
The recommended Anthropology programme for joint honours is generally as follows:

Year 1
Anthropology 101*/102*

Year 2
Two full courses (or half course equivalents) in Anthropology

Year 3
Two full courses (or half course equivalents) in Anthropology

Year 4
Two full courses (or half course equivalents) in Anthropology, one of which must be a theory-oriented course at the 400 level

Consult the recommended programmes of other departments to determine their requirements. Joint Honours Programmes have been approved with Anthropology and English, French, Geography,
German, History, Man-Environment Studies, Political Science, and Sociology.

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

Note 2
Students intending to qualify for the Type A Certificate for teaching high school must elect a minimum of nine courses in Geography.

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

Honours Programmes in Canadian Studies
Recommended Programme

Year 1
A French language course; consult Department of Classics and Romance Languages
The specified introductory course in the student’s proposed major subject (see note 1)
The equivalent of three other full courses chosen from among those specifically recommended for freshmen planning a Canadian Studies programme (see note 2)

Year 2
Canadian Studies 201*/202*
The equivalent of three full courses in the student’s major subject, one of which should specifically deal with Canada (see note 3)
The equivalent of two other full courses chosen from among those specifically recommended for students concentrating their programme in Canadian Studies (see note 4)

Year 3
Canadian Studies 300
The equivalent of three full courses in the student’s major subject, one of which should specifically deal with Canada (see note 3)
The equivalent of two other full courses chosen from among those specifically recommended for students concentrating their programme in Canadian Studies (see note 4)

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

Note 1
Students who wish to follow a programme in Canadian Studies do so by selecting a major department in the usual fashion and fitting the above recommendations to its requirements. Students proposing a double honours programme with a concentration in Canadian Studies should complete both the required introductory courses for their programme. (See page 81 for a further discussion of joint honours programmes).

Note 2
For descriptions of freshmen courses specifically recommended for students planning a programme in Canadian Studies see Chapter 16 of the Calendar.

Note 3
Students following a double honours programme will normally take the equivalent of two full courses in each of their major departments, one of which in each case should be the principal Canadian course at the 200, 300, or 400 level.

Note 4
Each of the participating departments has designated its principal Canadian course at the 200, 300 and 400 levels but students may choose from among any of the Canadian content courses listed in Chapter 16 of the Calendar. Many 300 and 400 level courses have specific prerequisites and it is often desirable to use the electives to pursue work in a particular discipline. Students following double honours programmes should reduce the number of electives at each level by one.

Honours Classical Studies
Recommended Programme

Year 1
Greek 100 or Latin 190
C. Civ. 101*/102*
Three other courses.

Year 2
Greek 200 or Latin 265*/266*
C. Civ. 251*/252*
C. Civ. 265*/266*
Two other courses.
**Arts Honours Programme**

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

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

**Note 1**
*In the single honours programme in Classical Studies, two courses out of ten must be from either Greek or Latin at the 200 level or better.*

**Joint Honours Programme in Classical Studies**

**Recommended Programme**

**Year 1**
Greek 100 or Latin 190
C. Civ. 101*/102*
Three other courses.

**Year 2**
Greek 200 or Latin 265*/266*
C. Civ. 251*/252*
C. Civ. 265*/266*
Three other courses.

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

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

**Note 1**
*In the joint honours programme in Classical Studies, one course out of eight must be from either Greek or Latin at the 200 level or better.*

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

**Honours Drama and Theatre Arts**

A total of twenty full courses including Faculty of Arts Group A and B requirements with an overall cumulative average of at least C- and Cumulative major average of B.

1) Ten of the student's courses must be in Drama and Theatre Arts.

2) Drama 101* and 102* are the required pre-requisites for most Drama and Theatre Arts courses.

3) Each student must satisfy the following requirements:
   A) Drama 329 (History of the Theatre)

   B) Drama 429* and 430* (Dramatic Criticism and Theatre Criticism)

   C) Drama 499 (Senior Seminar) *See Note 3 below*

   D) One full course from each of the following categories:
      1) Performance: Drama 225, 226*, 227*, 325
      2) Production: Drama 228*, 229*, 242, 326*, 327*, 330, 426*, 427*, 442

   E) Two full courses in Dramatic Literature to be chosen from:
      Drama 201*, 202*, English 232*, 233*, 362*, 363* or other approved courses in dramatic literature

   F) Two other courses to be chosen from Drama and Theatre Arts courses including Drama 301*, 302*, 316*, 421, 422, 425, 490*A-E, 491*A-E, or other approved courses in Fine Arts, Dance, Classics, English, or other related departments.

**Note 1**
The Honours B.A. programme in Drama and Theatre Arts will meet the requirements for an Ontario College of Education Type A Certificate, provided the student acquires at least two courses in another teaching subject (see current calendar requirements).

**Note 2**
*See Faculty of Arts Requirements for other required courses.*

**Note 3**
*Each student in the honours programme must complete a comprehensive presentation in the major area of concentration during the senior year. This presentation may take the form of an exhibit, a production thesis, or a recital. In some cases the student may elect to do a research thesis and a comprehensive examination. Arrangements must be made with the faculty at the beginning of the year so that showing dates and space may be scheduled. All graduands will meet with the faculty for an intensive discussion of the presentation.*

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

1) Eight of the student's courses must be in Drama and Theatre Arts.

2) Drama 101* and 102* are the required pre-requisites for most Drama and Theatre Arts courses.

3) Each student must satisfy the following requirements:
   A) Drama 329 (History of the Theatre)

   B) Drama 429* and 430* (Dramatic Criticism and Theatre Criticism)

   C) Drama 499 (Senior Seminar) *See Note 3 below*

   D) One full course from each of the following categories:
      1) Performance: Drama 225, 226*, 227*, 325
      2) Production: Drama 228*, 229*, 242, 326*, 327*, 330, 426*, 427*, 442
E) Plus one other course to be chosen from Drama and Theatre Arts course including Drama 301*, 302*, 316*, 421, 422, 425, 490*A-E, 491*A-E, or other approved courses in Fine Arts, Dance, Classics, English, or other related departments.

Note 1
The Combined Honours Programme in Drama and Theatre Arts will meet the requirements for an Ontario College of Education Combined Type A Certificate.

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

Note 3
Each student in the honours programme must complete a comprehensive presentation in the major area of concentration during the senior year. This presentation may take the form of an exhibit, a production thesis, or a recital. In some cases the student may elect to do a research thesis and a comprehensive examination. Arrangements must be made with the faculty at the beginning of the year so that showing dates and space may be scheduled. All graduands will meet with the faculty for an intensive discussion of the presentations.

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

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

It is also recommended that all students in the Honours Economics programme, once they are on campus, take Mathematics 130 and one of English 109*, 140*, 209°, or 210°.

Recommended Programme:

Year 1
Economics 101*/102*
Political Science 101*/102*
English 109° or 140°
Philosophy 140°
Two electives

Year 2
Economics 201*, 202*
Economics 211* or Math 130
Economics 221°
Economics 231*
One of Economics 233*, 241*, 261*, 263* or 191*
Two electives (one and one half if Math 130 is taken in place of Economics 211*)

Year 3
Economics 301*, 302*
Four half courses in Economics at 300 level or above
Two electives

Year 4
Economics 401*, 402*
Two half courses in Economics at 300 level or above
Three electives

Co-operative Programme in Economics
The student can earn an economics degree by following either the general or honours option in the traditional manner by attending the University during the fall and winter terms of each year.

Under a second option in the honours programme offered by the Department of Economics, the student attends the first two years during the fall and winter terms, and at the end of the second year serves a work term in industry or government in the spring term and alternating terms thereafter. The co-operative option therefore offers a mix of on-the-job experience and academic work. This option is available only to honours students who attain high standing at the end of the fall term of their second year in economics. For the first year, students enrol in the Faculty of Arts in the usual way.

Honours Applied Economics (Co-op)
Year 1
Economics 101°, 102*
Economics 191°, 192*
Mathematics 73A, 73D
Either Mathematics 83*, 84° or Mathematics 119A, 119B
Two electives (four half courses)

Year 2
Economics 201*, 202*
Economics 233*, 231*, 241*
Either Mathematics 81 or Mathematics 120A, 120B
Either Economics 211*, 221* or Mathematics 223a, 223b
One and one-half electives (3 half courses)
Term 3A
Economics 263, 301
One additional half course in Economics at the 300 level
Mathematics 515*
One-half elective (one half course)

Term 3B
Economics 302, 303
One additional half course in Economics at the 300 level
One elective (two half courses)

Term 4A
Economics 402
Economics 421
One and one-half elective (three half courses)

Term 4B
Economics 401
Economics 422
One and one-half elective (three half courses)

Honours Economics with Chartered Accountancy Option
At the end of this programme the student will have completed all of the formal university training required by the Canadian Institute of Chartered Accountants. The other principal requirements for the C.A. certificate are a minimum of two years of work for a public accounting firm and successful completion of the Provincial Institute’s examinations. 22 courses are required in order to receive the degree of Honours Economics with the C.A. option.

Year 1
Economics 101*, 102*
Economics 191*, 192*
Economics 193*, 194*
Math 132
English 101*
Elective (one full course)

Year 2
Economics 201*, 202*
Economics 211*, 221*
Economics 231*
Economics 291*, 292*
Economics 293*
Business 216 (WLU)
One elective (two half-courses)

Year 3
Economics 301*, 302
Economics 341*
Economics 345*
Economics 391*, 392*
Two and one half electives (five half-courses)

Year 4
Economics 393*, 394*
Economics 491*, 492*
Economics 493*
Three electives (six half-courses)

Economics Joint Honours Programmes
The core courses in economics for any joint honours programme normally are:
Economics 101*, 102*
Economics 201*, 202*
Economics 211*
Economics 221*
Economics 231*
Economics 301*, 302*
Economics 401*, 402
At least one and a half other Economics course (three half courses)

In addition, students must meet the requirements of the other department, as well as the Faculty of Arts Group A and Group B requirements. Selection of courses will be made with the assistance of the appropriate undergraduate officers. For Joint Honours Programmes, 22 courses are required.

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

Note 1
Economics and Geography
The degree requirements of the Faculty of Arts must be met for the B.A. Degree and those of the Faculty of Environmental Studies for the B.E.S. Degree. Students must take one of Economics 211* and 221* or its equivalent in Geography courses and the above core courses. Geography requirements will be found under Geography Joint Honours Programmes.

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 261*/263* must be taken and 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 toward 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.

Economics Minor for Honours Students in other Faculties
Economics 101*, 102*, 201*, 202*, 231*, either 211* or 221*, plus two additional courses in Economics (four half courses).

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

English 251
One full course equivalent in each of the following categories:
1) Language and Early Literature (305, 373, 375)
2) Historical Periods of British Literature (330, 410, 430, 451)
3) Major figures in British Literature prior to the Twentieth Century (310, 350, 362*, 363*)
Three approved English full course equivalents.

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

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

Recommended Courses
Classical Civilization 265*/266*
Courses in Philosophy, History, and Religious Studies.

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

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

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

English 251
One full course equivalent from each of three of the following categories:
1) Language and Early Literature (305, 373, 375)
2) Historical Periods of British Literature (330, 410, 430, 451)
3) Major figures in British Literature prior to the Twentieth Century (310, 350, 362*, 363*)
Three other approved English full course equivalents Twenty-two credits must be taken overall.

Note
Students must take at least 4 full course equivalents in English courses numbered 300 or above.

English Minor for Honours Students in other Faculties
101 or equivalent
Either 140*/141* or 251
One full course equivalent from 305, 310, 330, 350, 362*, 363*
Two other English full course equivalents.

Honours Fine Arts
Recommended Programme

Year 1
Fine 120* (see note 1)
The equivalent of nine additional half courses

Year 2
Fine 224* and Fine 226* (see note 1)
The equivalent of four half courses in Fine Arts (see note 2)
The equivalent of four additional half courses

Year 3
The equivalent of six half courses in Fine Arts (see note 1)
The equivalent of four additional half courses
Year 4
Fine 490*/491* (Senior Honours Presentation)
(see note 1)
The equivalent of four additional half courses in Fine
Arts (see note 2) including two senior seminars.
The equivalent of four additional half courses

Note 1
Of the twenty required Fine Arts courses, all Honours
Fine Arts students will take the following courses:
Fine Arts 110*/111*
Fine Arts 120*
Fine Arts 224*/226*
Fine Arts 490*/491*
two senior seminars

All of these must be taken in the years indicated except
for 110*/111* which must be completed before
students are admitted to the 4th year.

Note 2
Additional Fine Arts half courses will be selected to
include the following:
Group 1 two half courses in art history
two half courses in film
Group 2 two half courses selected from this group:

The remaining four required Fine Arts half courses
may not include music or dance.

Fine Arts Joint Honours Programmes
Students choosing a Joint Honours programme in-
volving Fine Arts must complete the equivalent of
fourteen half courses in Fine Arts and the Senior
Honours Seminar (two half courses). Unless other
arrangements are approved by the Department, all
students in joint honours programmes must complete,
before entering the fourth year, Fine 110*/111*,
120*, 224*/226* plus two from each of Group 1
and 2 (See note 2 above). Other Joint Honours pro-
grammes may be arranged upon consultation with
Fine Arts.

Honours French
Recommended Programme

Year 1
French 190 or French 191
Four more courses

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

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

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

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

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

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

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

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

Note 6
The degree requirements of the Faculty of Arts
(see page 84) must be met for the B.A. degree.

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

<table>
<thead>
<tr>
<th>Classical Studies</th>
<th>Philosophy</th>
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<tbody>
<tr>
<td>English</td>
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<td>German</td>
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<tr>
<td>Latin</td>
<td>Sociology</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Spanish</td>
</tr>
</tbody>
</table>

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

Recommended Programme (French)

Year 1
French 190 or French 191
Year 2
Three full courses in French or equivalent. (1)

Year 3
Two full courses in French or equivalent.

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

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

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

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

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

Note 5
The degree requirements of the Faculty of Arts (see page 84) must be met for the B.A. degree.

Honours Geography

Year 1
Geography 102* Introduction to Physical Geography
and one of but no more than three of

Geog. 101* Introduction to Human Geography
Env. St. 195* Introduction to Environmental Problems
Geog. 110* Tutorial in Human Geography
Geog. 152R* Introduction to the Developing World
Geog. 126R* The Emerging “Third World”
Geog. 127* Regional Problems of Europe

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

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

and one of

Geog. 203* Some Basic Topics of Cultural and Regional Geography
Geog. 232* Geography of Population
Geog. 320 World Regional Geography

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

Year 3
Geog. 381* The Nature of Geography
Geog. 391* Field Research
Two full credits of Geography electives.
Two credits chosen after consultation with the Department.

Year 4
Geog. 490 Seniors Honours Essay
and additional credits so that a student should have a minimum of 21 full credits.

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

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

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

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

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

Honours German

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

Year 2
Three full courses in German  
Two additional full courses

Year 3
Three full courses in German  
Two additional full courses

Year 4
Two full courses in German  
Three additional full courses

Note 1
Before graduation students must complete the Group A (i) and B requirements listed on page 84.

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

Note 3
With the permission of the department the student may spend one of the senior years at a university of a German-speaking country.

German Joint Honours Programmes
English and German  
French and German  
German and History  
German and Political Science  
German and Russian  
Philosophy and Literature (German)  
German and Geography

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

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

Note 2
Before graduation students must complete the Group A (i) and B requirements listed on page 84.

Note 3
With the permission of the departments concerned, the student of German may spend one of the senior years at a university of a German-speaking country.

Honours History

Year 1
Any first year programme that fulfills the general Faculty of Arts requirements is acceptable. An Introductory course in History is desirable: History 101 and 120 are recommended. Political Science 101 is also recommended to students intending to major in History.

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

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

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

Note 1
In addition to an Introductory History course, the Honours candidate must complete at least eight and preferably nine Honours History courses with at least a B average. The Honours History courses must be selected to ensure development and breadth. To ensure development they must include at least four courses in the 300 and 400 range, at least two of which must be Senior Seminars. To ensure breadth they must include at least one full course from each of the columns on the following page:
In addition to the departmental requirements for history courses, candidates must also have completed, preferably by the end of 3rd year, the Faculty of Arts A and B requirements with the following variation: one non-history course in humanities (A) must be above the 1st year level. The foreign language substitute (culture course) is considered to be at 1st year level. Also, students who plan to enter graduate school are strongly advised to develop facility in a language other than English.

Note 2
Graduation in this programme qualifies a student for admission to the Type A course in History at a College of Education in Ontario.

Note 4
It is possible for Honours students from another faculty to take a minor in History. Details should be sought from the Undergraduate Officer.

History Joint Honours Programmes
1) An Introductory History Course (preferably History 101 or History 120).

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

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

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

Combined programmes presently exist with Philosophy, Geography, German, Russian, English, Political Science, Sociology and Anthropology. The History Department is prepared to work out others for keenly interested students who otherwise meet Honours standards.

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

Honours Latin
Recommended Programme

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

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

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

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

Note 1
Before graduation, it is recommended that students complete Latin 251*/352*.

Note 2
Students intending to obtain a Type A certificate for teaching in Ontario Secondary Schools must take a Minor in addition to their Latin programme. In Greek as a minor subject, three courses (nine hours) are required. In French or English, five courses (fifteen hours) are required. The electives each year provide room for these requirements.

Note 3
A total of 20 courses must be successfully completed before graduation.

Note 4
The degree requirements of the Faculty of Arts must be met for the B.A. degree.
Before graduation students must complete a minimum of ten courses in Latin, or equivalent. Not more than three Classical Civilization courses should normally be taken as part of these ten courses.

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

- English
- French
- Spanish

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

Recommended Programme (Latin)

Year 1
One Latin course

Year 2
Three full courses in Latin or equivalent

Year 3
Two full courses in Latin or equivalent

Year 4
Two full courses in Latin or equivalent

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

Note 2
Latin 251*/352* are recommended before graduation.

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

Note 4
The degree requirements of the Faculty of Arts (see page 84) must be met for the B.A. degree.

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

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

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

Note 1
Each student must take at least five courses in one of the subject fields listed.

Note 2
The remaining courses may be used to fulfill the Arts Faculty requirements and to broaden the student's knowledge as he desires. Students wishing to attend an Ontario College of Education and teach are advised to take other courses in their proposed teaching area to satisfy the appropriate College of Education requirements.

Note 3
A minimum of 20 courses must be successfully completed before graduation.

Latin
100 Introductory Latin
190 Literature of the Republic
265* Letters of Cicero and Pliny
266* Epic
395* Medieval Latin Literature 1
396* Medieval Latin Literature 2

English
305 Old English
310 Middle English

Fine Arts
110* Introduction to World Art
218* Western Religious Art
310* Greek Art and Architecture
311* Roman Art and Architecture
314* Medieval Art 1
315* Medieval Art 2

History
258 History of Medieval Europe
353 Medieval Church History from 312 to 1449
363 Medieval English History
397 Origins of the Common Law
401 Medieval History (senior seminar)
Philosophy
280* History of Ancient Philosophy 1
281* History of Ancient Philosophy 2
390* Medieval Philosophy 1
391* Medieval Philosophy 2

Religious Studies
103G* Origins of the Judaeo-Christian Tradition 1
104G* Origins of the Judaeo-Christian Tradition 2
103J* Introduction to the Old Testament
104J* Introduction to the New Testament
239* Islamic Theology, Philosophy and Mysticism
325* The Orthodox Church

Medieval (Classical) Civilization
255* Medieval Civilization 1
256* Medieval Civilization 2

Modern European Language
French 190, 191, or 192
French 200 French Literature
French 409* Medieval French Language
French 411* Medieval Literature

German 121*/122* Introduction to German Literary Movements
German 341* The Age of Goethe (Classicism)
German 342* The Age of Goethe (Romanticism)
German 461* Introduction to the History of the German Language
German 462* Middle High German Literature
German 481 Humanism/Reformation
German 482* Baroque and Enlightenment

Spanish 191*/192* Intermediate Spanish
Spanish 325* Don Quijote
Spanish 326* The Picaresque Novel
Spanish 440 Medieval Spanish Literature and Linguistics

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

Note 1
Each student must take at least three courses in one of the subject fields listed in the above.

Note 2
The remaining courses may be used to fulfill the Arts Faculty requirements and to broaden the student's knowledge as he desires.

Students wishing to attend O.C.E. and teach are advised to take other courses in their proposed teaching area to satisfy O.C.E. requirements.

Note 3
A total of 15 courses must be successfully completed before graduation.

Honours Philosophy
Twenty full course equivalents
Ten in Philosophy, including 221*/222*, 240, 280*/281*, 282*/283*, 499 (tutorial)
Ten others, including Group A and B requirements (see page 84).

St. Jerome's students (See page 21 for further information).

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

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

Philosophy Requirements
Seven full-course equivalents in Philosophy, including 140* (or 240)
One full-course equivalent from 280*/281*, 282*/283*
One half-course in Social and Political Philosophy (e.g. 125*, 225*, or 325*)
One half-course in Ethics (e.g. 221* or 222*)

Philosophy 341* and 362*

Honours Philosophy and English
Philosophy Requirements
Seven full-course equivalents in Philosophy, including 221*/222*, 240 or 140*, 280*/281, 282*/283*, Philosophy 331

English Requirements (See English Joint Honours Requirements)

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

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

**Philosophy Requirements**
The equivalent of at least seven full courses in Philosophy which must include 140*, 221*/222*, 280*/281*, 282*/283*, 446*.

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

**Other Requirements**
Eight full course equivalents, including A and B requirements (page 84).

Honours Philosophy and Literature

**Recommended Programme**

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

**Year 2**
One of Philosophy 221*/222* or 280*/281*
Philosophy 282*/283* and one other Philosophy course
French: Minimum of two full courses or equivalent (see note)
(or German 281*/282* and one of German 241*/242*, 251*/252*, 271*/272)
One elective (Social Science, if requirement met in first year)

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

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

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

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

Joint Philosophy – Mathematics Programme

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

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

Philosophy 340, 258*/359*, 280*/281*, 282*/283*
Three others, one of which is in a value area
Mathematics 129, 130, 229, or 237 and one of 228, 233, 234, 239, 240
Two others

Further requirements for the degree B.Math, (Mathematics and Philosophy) see Chapter 14
Further requirements for the degree B.A. (Philosophy and Mathematics)
Six more courses, including A and B requirements for an Arts Degree

Honours Philosophy and Political Science

**Philosophy Requirements**
The equivalent of at least seven full courses in Philosophy which must include 221*/222*, 240 (or 140*), 280*/281*, 282*/283*, 327*, 362*.

**Political Science Requirements** (See Political Science Joint Honours Requirements)

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

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

**Psychology Requirements** (See Psychology Joint Honours Requirements)

**Other Requirements**
Either Philosophy or Psychology 499
Seven full course equivalents, including A and B requirements (see page 84).

Honours Philosophy and Religious Studies

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

**Religious Studies Requirements** (See Religious Studies Joint Honours Requirements)

**Other Requirements**
Eight full course equivalents to make a total of 22 full course equivalents, including either Philosophy or Religious Studies 499, and A and B requirements (see page 84).

Honours Philosophy and Sociology

**Philosophy Requirements**
Seven full-course equivalents in Philosophy, including 221*/222*, 240 (or 140*), 280/281*, 282*/283*, and 362*

**Sociology Requirements** (See Sociology Joint Honours Requirements)

**Other Requirements**
Either Philosophy or Sociology 499
Seven full course equivalents, including A and B requirements (see page 84).

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

Honours Political Science

**Recommended Programme**

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

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

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

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

Note
Four of the nine Political Science courses above the 100 level must be selected from four different fields of the discipline. For further information on this please consult the Department.

Political Science Joint Honours Programme

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

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

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

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

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

Recommended Programme

Year 1
Psychology 101* / 102*
The equivalent of four additional full courses

Year 2
Psychology 283* / 284*
The equivalent of one full course in Psychology
(see Note 1)
The equivalent of three additional full courses

Year 3
Psychology 285* / 331*
The equivalent of two additional full courses in Psychology
(see Note 1)
The equivalent of two additional full courses

Year 4
Psychology 498 or 499
The equivalent of two additional full courses in Psychology
(see Note 2)
The equivalent of two additional full courses

Note
Honours students are required to complete one research half-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 with Early Childhood Education and Care Option

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 an Ontario preschool setting.

In order to receive the degree in Honours Psychology with Early Childhood Education and Care Option the student must have a minimum of 22 courses.

Recommended Programme

Year 1
Psychology 101* / 102*
The equivalent of four additional full courses

Arts

Honours Programme

Year 2
Psychology 211* / 203* or 207*
Psychology 241* / 242*
Psychology 283* / 284*
Health Studies 140* / 141*
The equivalent of two additional full courses

Year 3
Psychology 285* / 331*
Psychology 311* / 341*
Psychology 321*
Psychology 393* / 293* or 295*
Health Studies 346* / Recreation 200*
The equivalent of one and one half additional full courses.

Year 4
Psychology 421
Psychology 498 or 499
Psychology 453* / Dance 364*
Health Studies 345* / 440*
The equivalent of one additional full course

Note
Students must obtain a minimum of 9 Psychology courses with letter grades to meet the requirements for the honours degree. Psychology 321* and Psychology 421 are offered on a Credit-Fail basis only.

Psychology Joint Honours Programmes

Students choosing a Joint Honours programme involving Psychology must complete the equivalent of seven full courses in Psychology and an Honours thesis course. Unless other arrangements are approved by the Department, all students in Joint Honours programmes must complete, before entering the fourth year, Psychology 283*, 284*, 285*, 331*, and one research half 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 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.

Minor Programme

The department offers a minor programme in Psychology. Any student interested in planning a sequence of five courses to complement his major field of study is encouraged to consult the Undergraduate Officer. All minor programmes must be approved by the Department.
Honours Religious Studies

Year 1
Any five first year courses that meet the general requirements of the Faculty of Arts and include one of the following full-course equivalents in R.S.:

103G*/104G*, 103J*/104J*, 110*/111*,
130P*/131P*, or 160R*/161R*.

Years 2, 3 and 4
Nine full R.S. courses (or the equivalent) and six electives. The R.S. courses are to include:

a) Two full-courses (or the equivalent) from one of the following groups and one from the other:

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
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</thead>
<tbody>
<tr>
<td>Hinduism</td>
<td>Judaism</td>
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<tr>
<td>Buddhism</td>
<td>Christianity</td>
</tr>
<tr>
<td>Chinese Traditions</td>
<td>Islam</td>
</tr>
</tbody>
</table>

b) Two full-courses (or the equivalent) at the 398-level or above.

c) At least one Senior Seminar.

Note
Total number of courses for the degree, twenty.

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

Honours Russian

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

Year 2
Two full courses in Russian
Three additional full courses

Year 3
Three full courses in Russian
Two additional full courses

Year 4
Three full courses in Russian
Two additional full courses

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

Note 2
Before graduation students must complete the group A (i) and B requirements listed on page 84.

Russian Joint Honours Programmes
English and Russian
French and Russian
German and Russian
History and Russian
Political Science and Russian
Geography and Russian
Philosophy and Russian

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

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

Note 2
Before graduation students must complete the Group A (i) and B requirements listed on page 84.

Honours Social Development Studies

Year 1
Interdisciplinary Social Science 120R*, Social Work 120R*, Sociology 120R*, Psychology 120R*

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

The equivalent of two additional full courses

Year 2
Interdisciplinary Social Science 250R*/251R*
At least three half courses from among:
Interdisciplinary Social Science 220R*, 221R*
Social Work 220R*, 221R*, 222R*
Sociology 220R*, 221R*, 205R*
Psychology 220R*, 221R*

The equivalent of two full courses from chosen theme area (see Note 1)

The equivalent of one additional full course

Year 3
Interdisciplinary Social Science 320R*, Social Work 326R*
At least three half courses from among:
Social Work 320R*, 321R*, 322R*
Sociology 322R*, 323R*, 325R*, 326R*
Psychology 320R*, 321R*
The equivalent of two full courses from chosen theme area (see Note 2)

The equivalent of one additional full course

**Year 4**

Interdisciplinary Social Science 469R, 499R

The equivalent of three additional full courses

**Note 1**

Each student must successfully complete four full credits related to one of the multidisciplinary theme areas listed below. Programme requirements provide the knowledge prerequisite for most theme area courses but in some instances additional prerequisite courses must be taken. All students will be expected to make a rational selection of theme courses designed to fit their needs and plans. In light of the above, careful planning of the sequence of courses should be made with the advice and approval of Renison faculty advisors.

The listing of approved courses under each of the four theme areas will be subject to periodic change to reflect new courses and changed calendar descriptions. In addition to these suggested courses students may request approval for other courses (e.g. transfer credits, independent study courses) which can be shown to be related to the theme area.

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<table>
<thead>
<tr>
<th>Theme Areas</th>
<th>Home and School</th>
<th>Work</th>
<th>Community</th>
<th>Mental Health</th>
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<tr>
<td>Alreas</td>
<td>Engl 208C*</td>
<td>Econ 351*</td>
<td>Anth 333*</td>
<td>Engl 108H*</td>
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<td>HRCS 230*</td>
<td>CivE 110*</td>
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<td>391*</td>
<td>342*</td>
<td>Phil 425*</td>
<td>359*</td>
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<td>402*</td>
<td>Plan 156*</td>
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<td>225R*</td>
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<td>303*</td>
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</table>

**Course Descriptions may be found in Chapter 16.**

**Honours Sociology**

**Recommended Programme**

**Year 1**

Sociology 101*

One other half course in Sociology at 200 level

Four elective full year courses (or equivalent half courses)

**Year 2**

Sociology 202*

Two full year courses in sociology (or equivalent half courses)

Two and one half elective full year courses (or equivalent half courses)

**Year 3**

Sociology 321*/322*

Two full year courses in sociology (or equivalent half courses)

Two elective full year courses (or equivalent half courses)

**Year 4**

Sociology 425*/426*

Sociology 499

One full or two half courses in Sociology

Two elective full year courses (or equivalent half courses)

**Note 1**

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

**Sociology Joint Honours Programmes**

Sociology has joint honours programmes with the following: Anthropology, Classics and Romance Languages, English, History, Philosophy, Political Science, Psychology, Mathematics and Recreation. The usual recommended programme in Sociology for joint honours is seven and one-half full course equivalents distributed as follows: a half course in introductory sociology (101*); a half course in statistics (202*); two half courses in research methods (321*/322*); two half courses in sociological theory to be chosen from 331*, 402*, 425*; the equivalent of three and one-half full courses of electives in Sociology; and an honours thesis course (499*) or the equivalent in the related department.
For requirements in joint honours with History, Philosophy, Psychology and Mathematics see the Department Undergraduate Officer.

Note 2
In the joint honours programme with French (Classics and Romance Languages) Soc. 202* may be replaced by an elective in Sociology.

Honours Spanish
Recommended Programme

Year 1
Spanish 191*/192* (students with no high school Spanish will take Spanish 101*/102* in the first year, and Spanish 191*/192* and 210 in the second year)
Four more courses

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

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

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

Note 1
Before graduation, the student must complete a minimum of ten full courses (or equivalent) in Spanish. If he intends to enter the teaching profession, he is expected to complete Spanish 191*/192*, 251*/252* and 351*/352*.

Note 2
To establish a Minor in a sister discipline, the student must complete five courses (fifteen hours) in that discipline. Students registering in Honours Spanish are strongly advised to minor in French.

Note 3
With the permission of the department, the student may spend his third year enrolled in an acceptable university in Spain or in Mexico.

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

Note 5
The degree requirements of the Faculty of Arts (see page 84) must be met for the B.A. degree.

Note 6
Students in year 4 must have the permission of the Department to enrol in Spanish courses on the 100 or 200 level.

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

Classical Studies
English
French
German
History
Latin
Sociology

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

Recommended Programme (Spanish)

Year 1
Spanish 191*/192* (students with no high school Spanish will take Spanish 101*/102* in the first year, and Spanish 191*/192* and 210 in the second year)

Year 2
Three full courses in Spanish or equivalent.

Year 3
Two full courses in Spanish or equivalent.

Year 4
Two full courses in Spanish or equivalent.

Note 1
Before graduation, students in combined honours programmes must complete a minimum of eight full courses (or equivalent) in Spanish.

Note 2
Those planning to enter the teaching profession are expected to complete Spanish 191*/192*, 251*/252* and 351*/352*.

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

Note 4
The degree requirements of the Faculty of Arts (see page 84) must be met for the B.A. degree.
Faculty of Engineering
Mechanical Engineering students in Soils lab
The Co-operative Engineering Programme

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

While Co-operative programmes have been offered in many other countries, and the inherent advantages are well recognized, the Co-operative Engineering Programme at the University of Waterloo is unique in Ontario and was, until recently, unique in Canada.

The engineering curricula at the University of Waterloo provide a sound basis in Mathematics and Pure Science and in Engineering Science and Design. The first year of the programme is common for all programmes except Chemical Engineering and Systems Design. A substantial part of the work of the first and second years is common to all programmes. Starting with the second year (first year for Chemical Engineering and Systems Design) students elect one of the five principal divisions of engineering. The curriculum for each of the five basic programmes combines required "core" subjects essential to the field, and "elective" subjects permitting considerable diversity in individual programmes of study. An important part of the curriculum is a series of electives in the Humanities and Social Sciences.

The Co-operative programme brings students into direct contact with industry and the engineering profession and exposes them to problems typical of those encountered in practice. Students are introduced to full-scale engineering projects and operations, far beyond the scope of any university laboratory. Employment on the work terms generally is secured by students through on-campus interviews with Co-operative employers. Such arrangements and other features of the work terms are the responsibility of the Department of Co-ordination of the University which produces the necessary liaison between the University and the employers. It should be understood that there can be no guarantee of work term employment, although the Department of Co-ordination will make every effort to provide as many opportunities as possible. Through personal experience in industry, the students' educational environment is extended and their total education advanced. The co-operative experience represents much more than an opportunity to secure financial assistance, or to make an early start of a vocation. It provides the maturing prospective engineer with an opportunity for self-discipline and direction, and allows an early appreciation of the social and personal aspects of engineering through direct association with a technological environment.

Through this carefully organized and implemented programme of co-operative study and work, it is felt that graduates will be well prepared for a career which requires high standards of professional skill and learning. The increasing dependence of our society on modern technology certainly requires engineers who, along with the technical ability, are prepared for individual responsibility and clearly understand the relationship of their profession to industry and society. A more detailed explanation of the Co-operative programme is given in Chapter 6.

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

- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering
- Systems Design Engineering

All programmes are of modern scientific character and, instead of a separate programme in Engineering Physics, opportunity is provided for optional additional study in Mathematics and Science in each of the five main programmes. All programmes entail five years of undergraduate study on the co-operative system.

The Degrees of Master of Applied Science (M.A.Sc.) and Doctor of Philosophy (Ph.D.) are also awarded in Engineering. For further details, consult the Graduate Studies Calendar and the list of the particular courses in graduate work in the various departments.

Co-operative Programme
The eight terms of study and six terms of industrial employment provided in the programme are arranged as shown in the diagram on the following page.
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, and, as indicated on the diagram, also complete the programme and graduate together. Both groups, of course, have the same total time on campus and in industry, one group having a double academic term at the start of the programme and the other having a double academic term at the end of the programme. The division at the end of the first term of study is based upon student preferences, financial considerations of students, etc. Precise dates for the beginning and end of the various terms are shown in the academic calendar on page 6.

The programme in Systems Design is not divided into two groups. All students in this programme start with four months of school before going out on the first work term in the Winter.

Admission

The admission requirements and procedures for all programmes are outlined in Chapter 2 of this Calendar. The following emphasize some of the admission requirements which relate specifically to the Faculty of Engineering.

Applicants From Ontario Year 5

Applicants must present the following Mathematics courses – Relations and Functions, Calculus, Algebra, as well as Chemistry and Physics in their overall Year 5 programme. Applicants who do not have these specific Year 5 courses but who have obtained a high overall standing, including at least Relations and Functions and Calculus, are encouraged to apply for admission.

Admission As An Adult Student

It is recommended that applicants attempt to obtain standing in Ontario Year 5 Mathematics and Science courses or their equivalent. The university has developed special pre-university mathematics and science courses which can be taken by correspondence and which are recommended for adult students. To discuss admissibility and appropriate qualifying work applicants are advised to contact the Assistant Registrar 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.

Registration

September 2, 3, 4, 5, 1975.

Fees

Refer to Section 3 page 29.

Examinations and Promotions

The Faculty constitutes the examining body for all examinations and is responsible for all decisions on grades, promotions, failures, deferred examinations, appeals and the preparation of recommendations for the granting of degrees. Students are examined and marks are set for individual subjects on completion of the work for that subject. With few exceptions beyond first year, subjects are one term in length, and promotion decisions are made at the end of each term.

For the purposes of promotion the two terms of first year are considered as a unit and promotion decisions are made at the conclusion of the second term only. However, a first year student's progress is reviewed at the end of the first term and the Engineering Faculty Council may recommend or require a student to withdraw if, in the opinion of the Council, the student is unlikely to benefit from further study.

The procedures through which promotion decisions are made are as follows:

1) At the end of each term examining faculty members submit marks to the Engineering Examinations and Promotions Committee which prepares promotion recommendations for subsequent approval by the Engineering Faculty Council. Once approved, the
decisions are reported to the students through the Registrar's Office. All recommendations to award degrees must be approved by Senate.

2) Promotion decisions are made at the end of each term except the first term. The decision for each student is based on a weighted average computed from his marks in individual subjects following the weighting scheme for his department. For promotion, a student must achieve an average of 60% or higher, except in special cases where, at the discretion of the Faculty, promotion may be granted with an average below 60%.

There is no "passing" or "failing" of individual subjects. Promotion is based on the weighted overall average and a minimum grade is not normally required in any one subject, although individual departments may designate minimum grade requirements in certain courses. There are no supplemental examinations except in the last term of the programme.

3) All promoted students will be shown as having obtained First, Second or Third Class Honours according to the following table:

<table>
<thead>
<tr>
<th>Average</th>
<th>Honours</th>
</tr>
</thead>
<tbody>
<tr>
<td>80.0 to 100%</td>
<td>First Class</td>
</tr>
<tr>
<td>70.0 to 79.9%</td>
<td>Second Class</td>
</tr>
<tr>
<td>60.0 to 69.9%</td>
<td>Third Class</td>
</tr>
</tbody>
</table>

The exception to this will be those special cases where a student has less than 60% but who has been given a "Promotion Granted" decision.

It should be specially noted in such "Promotion Granted" cases from 1B that emphasis is placed on Math 12 and 21, Physics 11 and GE 122.

Students will be ranked in order of overall averages. A student's class standing will be shown on his report. Failing students will be given their failing average.

4) Students who are not promoted at the end of the First Year will be required to repeat at least the second term, except that re-admission will be denied if, in the opinion of the faculty, a student is deemed unlikely to profit from further study.

5) Students who are not promoted at the end of the third or subsequent terms will be required to repeat all or part of the work of the term failed.

Where timetables permit, repeating students may be excused from repeating individual courses in which good marks have been obtained, and permitted to register in other appropriate courses, at the discretion of the student's department.

Previous marks in exempted courses will not be included in the average of the repeated term.

6) A student may not repeat a given term more than once. The Examinations and Promotions Committee decisions "Failed, May Repeat" and "Promotion Granted" are to be considered equivalent in that the maximum number of such decisions a student may accumulate is two.

7) The Engineering Faculty Council may recommend or require a student to withdraw at any time if, in the opinion of the Council, the student is unlikely to profit from further study.

8) A student who withdraws from the programme less than four weeks before the commencement of the final examinations period in the programme, shall normally be deemed to have failed the year or term in which he was enrolled at the time of withdrawal. This does not apply to the 1A term.

9) Courses taken by students that are in addition to the degree requirements will not be included in a student's average. Marks obtained in extra courses will be reported on a student's transcript.

10) Courses taken by students during work terms will not be included in a student's average for any term. The marks of courses taken at the University of Waterloo, however, will be reported on a student's transcript. Normally students will be expected to register for the minimum number of courses specified by the calendar for the appropriate term.

11) In special cases other symbols may be substituted for marks and the following list summarizes these symbols and their meanings:

AEG  - Student was ill as per medical evidence.

CR   - Performance was Satisfactory.

NCR  - Performance was Unsatisfactory.

INC  - Student obtained permission not to write because of illness or death in family, etc. The exam is Deferred to a later date.

DNW  - Student Did Not Write the exam and did not officially drop the course.
AUD — Course Audited only. This symbol is generated by the Registrar's Office.

12) Students who feel that assigned grades or the promotion decision do not reflect a just evaluation of their achievement, or who have done poorly because of sickness or unavoidable absence, may appeal faculty decisions. All appeals should be addressed to the Chairman of the Engineering Examinations and Promotions Committee, Registrar's Office, University of Waterloo. Reasons in support of the appeal must be provided. Doctor's certificates and similar supporting documents where appropriate should be included with the student's statement. It is to the student's advantage to file his appeal as early as possible, preferably before the Examinations and Promotions Committee meets to discuss the grades affected. Appeals must normally be submitted no later than three weeks after the promotion decisions are mailed by the Registrar's Office.

13) Changes to a student's original registration form may be permitted at the discretion of a student's department. All such arrangements must be indicated and approved before the end of the normal "Change Period", which is a period of three weeks at the beginning of each term. After the end of the three week period, only exceptional cases for change will be considered.

Undergraduate Co-operative Work Term Reports

Work reports are recognized formally as part of the requirements for the Bachelor's degree. The regulations related to work term reports are:

1) Each Engineering student is required to submit a minimum of four satisfactory work reports prior to graduation. For those students admitted to advanced standing into 2B or 3A with only 3 work terms remaining, only 3 satisfactory work reports would be required.

2) All work reports shall be submitted to the Department of Co-ordination on the first day of lectures for the academic term following the work term and subsequently distributed to departments within 1 week. Failure to comply with the deadline will result in no work report credit for that term.

3) Work reports shall be compulsory for all students in their first work term and these reports shall be assessed by the Department of Co-ordination. The reports and evaluation forms shall be returned to the students and copies of the evaluation forms shall be placed in the students' files in the Department of Co-ordination.

4) Three additional work reports shall be submitted for the remaining five work terms. Students are encouraged to reserve a report for their final work term. If students wish, they may submit the additional reports and the evaluations of these reports will be added to their work term record. Students may be required to submit work reports to employers.

5) Work reports, other than those completed by first year students, shall be evaluated by the Engineering Faculty following the same procedure suggested in Item 3. This shall include reports marked by employers.

6) Work reports rated as unsatisfactory may be re-written and re-submitted during the academic term. Students with unsatisfactory work reports may be required to take formal instruction in technical report writing.

7) Continued registration in later academic terms may depend on satisfactory work-terms performance and/or reports.

Academic Programmes

It is important to summarize the principles and objectives of the engineering curricula at Waterloo, as the role of the engineering graduate in a modern industrialized society. Technological advances and economic evolution produce an ever-changing environment in which it is seen that obsolescence comes to entire industries as well as to processes and products, and primary attention is necessarily focused on the capacity to innovate design in process and product. Engineers are undoubtedly amongst the most important leaders in such a society and the conditions noted lead to primary concern with fundamental education, versatility of mind, and the ability to maintain a position close to the frontiers of development.

Rigorous work in mathematics and the sciences is emphasized throughout the programme, and the common work in these basic areas of science in the first and second years is used in each departmental programme to support advanced studies in engineering analysis and synthesis. It should be noted that the first year of the engineering programme provides almost the same mathematics, physics and science courses as found in the first year in the Faculty of Science.

The core programmes for each of the five major divisions of engineering provide the foundation for professional activity in any field of engineering interest. A wide variety of elective courses are available in Engineering, Science, Mathematics, the Humanities, and Social Sciences, from which optional programmes may be developed under the guidance of faculty advisors.

The optional programmes that are made available under the curricula indicated should not be construed as specialization, but are rather intended to foster
independent study and maturity of learning by permitting special undergraduate activity in subject areas which hold maximum interest. Certain courses, normally taken only at the post-graduate level, may in fact be included in undergraduate programmes where necessary prerequisites are met. It is strongly emphasized that professional specialization in engineering requires intensive study beyond the Bachelor’s degree as well as extensive experience in practice.

It is important to realize that the separation of engineering studies into five basic curricula areas reflects primarily divisions of learning in engineering, rather than divisions by classes of industry, for instance. It is to be noted that the chemical industry, the aeronautical industry, the mining industry, the pulp and paper industry – every major industry in fact – requires engineers from all primary divisions of the profession. Undergraduate study in any of the five basic divisions provided may lead, perhaps with further study or special experience as necessary, to professional activity in consulting work, or to staff positions in any kind of industry or any government agency, in research, education, design, design development, or administrative work.

**Year 1 Engineering Students**

All students enrolling in Year 1 are required to choose and register in one of the following three programmes:

a) General  
b) Chemical Engineering  
c) Systems Design

Students enrolling in General and Chemical Engineering must register in the courses indicated in the following table:

**Term 1A**  
Mathematics 12  
Mathematics 21  
ChE 102 Chemistry for Engineers  
Physics 11  
GE 111 Graphics or ChE 100 Introductory Engineering Concepts 1  
GE 113 Measurement  
One of GE 102, 103, Phil 125K or Sci 110K

**Term 1B**  
Mathematics 12  
Mathematics 21  
GE 111 Graphics or ChE 101 Introductory Engineering Concepts 2  
GE 120 Synthesis  
GE 121 Digital Computation  
GE 122 Electricity & Magnetism  
One of GE 102, 103, Phil 125K or Sci 110K

Students in Systems Design have an entirely separate programme as described on page 123 under the Department of Systems Design. They must register for the courses as described in Year 1 Systems Design.

At the completion of the First Year, students in the General and Chemical Engineering programme are required to select one of the following major divisions of engineering for the second year of study:

Chemical Engineering  
Civil Engineering  
Electrical Engineering  
Mechanical Engineering

Students intending to go into Chemical Engineering are encouraged to take ChE 100 and 101 in place of GE 111, 113, 120. Other students may easily transfer into second-year Chemical Engineering by completing aspects of ChE 100 and 101 which are not covered in that section of the General Engineering programme; this may be carried out by reading assignments during the 1B off term.

Systems Design students with good standing may transfer into other Engineering departments in second year.

**Note**  
*Detailed course descriptions commence in Chapter 16. Courses beginning with GE (General Engineering) can be found on Page 307.*
Chemical Engineering

There are many possible answers to most problems. Society expects engineers to choose the best answers to practical problems. The modern engineer is involved not only with his traditional goals of satisfying material needs but also with the overall quality of life which is affected by his processes and products.

Chemical engineers in particular apply the natural and social sciences to solve problems where physico-chemical transformation of matter plays a significant role. Examples of the broad fields of application are: design, construction, operation, quality control, sales, management, research, education and government.

In contrast to chemists or other kinds of engineers, chemical engineers are generally involved with large-scale operations based on the chemical sciences.

Chemically-based technologies produce metals, drugs, food, alcohol, soap, fertilizers, gasoline, plastics, rubbers, paper, paint, textile fibres and many other products. Some of these technologies can also generate pollution problems which must be solved by chemical engineers in their overall process operations and designs.

Most chemical engineers are employed in the general areas of production, sales, management and research. A substantial number go into government and teaching. An increasing number are entering interdisciplinary areas such as food engineering, bio-medical engineering, and environmental engineering. The solution to crucial problems of health, nutrition, ecology, and pollution require chemical engineering expertise.

More women enter chemical engineering than any other branch of engineering and this trend is increasing, as women become more aware of the career possibilities in this profession.

The basic objective of the undergraduate programme is to provide the student with an education appropriate for a career in one of the above fields, or for further 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 six options oriented towards Biochemical and Food Engineering, Extractive and Process Metallurgy, Mathematical Analysis and Control, Pollution Control Engineering, Polymer Science and Engineering, and Transport Processes.

Biochemical and Food Engineering Option
The Biochemical and Food Engineering option is concerned with the economic processing of materials of biological character or origin. It is primarily involved with waste treatment, food processing and the manufacture of microbial products such as alcoholic beverages, yeasts, antibiotics, vitamins, enzymes, etc. The usefulness of these studies is obvious in an under-fed, unhealthy and over populated world with pollution problems, and for the Canadian economy in which agricultural products play a significant role.

Extractive & Process Metallurgy Option
Extractive and Process Metallurgy as presently practiced in industry requires further understanding of the principles of chemical engineering applied to metallurgical processes in order to improve many of the present pyrometallurgical, electrolytic and hydrometallurgical processes used in Canada. The Waterloo programme inter-relates chemical engineering and chemical metallurgy in order to achieve this goal.

Mathematical Analysis & Control Option
Mathematical Analysis and Control also forms a core area involving studies in optimal control, economic or process optimization, and simulation. At Waterloo, this is probably the most developed area of its type at a Canadian university.

The department's vigorous postgraduate research activities provide necessary vitality and up-dating of the undergraduate programme in all the above-mentioned fields.

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

Polymer Science & Engineering Option
The Polymer Science and Engineering option covers a wide scope but special emphasis is placed on the physics and physical chemistry of polymers, and on the modification of polymer structure by physical or chemical means. At present, a significant percentage of the Canadian chemical industry is directed towards products classed as polymers (plastics, elastomers, synthetic fibers) and most of their production is in Ontario.

Transport Processes Option
Transport Processes form a core area of chemical engineering and in this option aspects of fluid flow, heat transfer and mass transfer and reaction rates which are important in all chemical and allied industries are developed further in the senior years.

The Curriculum
The curriculum is constantly under revision to meet changing needs. At present about one-quarter of the curriculum consists of elective courses. Almost half of these electives may be chosen from non-technical...
courses in the humanities or social sciences; the remaining electives are technical courses, of which three are normally selected from one of the technical option groups. The other technical electives may be chosen from any other approved science or engineering courses according to individual student interest and career objectives.

The Waterloo programme is the most comprehensive and flexible of its kind in Canada. It is also unique in Ontario in that the co-operative system of education provides an integrated pattern of academic study and practical experience which allows the prospective engineer an opportunity to secure financial assistance and to make an early start on a vocation.

Guide to Undergraduate Chemical Engineering Course Numbers

Beginning in the academic year 1972-73 a new revised curriculum was developed and a new three digit number was assigned to each course offered by the Chemical Engineering Department. These course numbers are prefixed by the abbreviation ChE; courses offered by other departments are also identified, e.g. Math., Chem. It is to be noted that transition to the revised curriculum will not be completed until 1974-75. The code for the new numbers is consistent with the graduate course numbers and is as follows:

First digit (1-5) year
1-4: Year of study, core courses
5: Fourth year, elective courses

Second digit (0-8): subject matter
0: General Engineering
1: Transport Processes
2: Mathematics, Control, Economics
3: Chemistry, Kinetics, Catalysis
4: Polymer Science and Engineering
5: Extractive and Process Metallurgy
6: Biochemical and Food Engineering
7: Ecology, Environmental Engineering
8: Projects, seminars, etc.

Third digit (0-9): term
Even numbers: first term
Uneven numbers: second term

<table>
<thead>
<tr>
<th>Core Courses</th>
<th>Lectures (hr/wk)</th>
<th>Labs/Problems (hr/wk)</th>
<th>Tutorials (hr/wk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE 220</td>
<td>Applied Mathematics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 230</td>
<td>Physical Chemistry 1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>ChE 232</td>
<td>Inorganic Chemistry 1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Chem 26</td>
<td>Organic Chemistry 1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Math 22</td>
<td>Calculus 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 211</td>
<td>Transport Processes 1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ChE 231</td>
<td>Physical Chemistry 2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>ChE 233</td>
<td>Physical-Chemical Laboratory</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Chem 36</td>
<td>Organic Chemistry 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Math 31</td>
<td>Differential Equations</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 312</td>
<td>Transport Processes 2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>ChE 320</td>
<td>Applied Mathematics 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 330</td>
<td>Chemical Engineering Thermodynamics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 332</td>
<td>Inorganic Chemistry 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 334</td>
<td>Instrumental Methods Laboratory</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 313</td>
<td>Transport Processes 3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>ChE 315</td>
<td>Chemical Engineering Laboratory</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 331</td>
<td>Chemical Reaction Engineering</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 420</td>
<td>Process Dynamics and Control 1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 442</td>
<td>Engineering Economics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 482</td>
<td>Technical Seminar and Process Design</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ChE 280,281</td>
<td>General Awareness Seminar</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>380,381</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>480,481</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ChE 007</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B) Elective Courses
In addition to the core courses listed above, a minimum of 13 elective courses must be taken. The usual sequence of technical (T) and non-technical (NT) electives is as follows:

<table>
<thead>
<tr>
<th>Term</th>
<th>T</th>
<th>NT or T</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2B</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3A</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3B</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>4A</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4B</td>
<td>(i)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 &amp; one of ChE 583, 585</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or (ii) 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 &amp; ChE 581 (worth 2 technical courses)</td>
</tr>
</tbody>
</table>

Four to six of these courses may be chosen from non-technical electives, of which at least three are to be (one required in each of the terms 2A, 2B, 3A, and 3B, and one open elective in each of the terms 4A and 4B). Four non-technical elective courses must be successfully completed beyond year 1B. Marks for these courses are not included in the term averages from 2A to 3B inclusive.

The remaining seven to nine courses must be technical electives of which at least three are to be selected from one of the first seven option groups listed below. An elective course is normally based on three lecture hours per week for one term unless otherwise specified in the detailed course description. The other technical electives may be chosen from the Chemical Engineering courses or from other science or engineering courses according to interest, but the choice must be approved by the Associate Chairman (Undergraduate Studies).

The three technical electives for each of the seven Chemical Engineering option groups are identified below. Within each option group, the first course is normally taken in the 4A term and the other two courses in the 4B term.

1) Transport Processes
- ChE 511 Selected Topics in Process Applications
- ChE 510 Physico-chemical Properties of Gases and Liquids
- ChE 513 Non-Newtonian Flow and Heat Transfer
- ChE 570 Air Pollution

2) Mathematical Analysis and Control
- ChE 520 Chemical Engineering Analysis
- ChE 521 Process Dynamics and Control 2
- ChE 523 Process Control Laboratory

3) Polymer Science and Engineering
- ChE 540 Introduction to Polymer Science
- ChE 541 Physical Chemistry of Polymers
- ChE 543 Polymer Laboratory

4) Extractive and Process Metallurgy
- ChE 550 Introduction to Extractive Metallurgy
- ChE 551 Metallurgical Chemistry
- ChE 553 Principles of High Temperature Extractive Metallurgy

5) Biochemical and Food Engineering
- ChE 560 Introduction to Biochemical Engineering
- ChE 561 Fermentation Operations
- ChE 563 Food Processing

6) Pollution Control Engineering
- ChE 511 Selected Topics in Process Applications or ChE 570 Air Pollution
- ChE 560 Introduction to Biochemical Engineering
- ChE 571 Water Pollution

7) Research/Design Option
- ChE 580 Research-Design Project 1
- ChE 581 Research-Design Project 2 (worth 2 courses)

Other Research and/or Design Projects
- ChE 583 Process Systems Design
- ChE 585 Technical Elective Project

Academic Programme for Each Term (1975-76)

Year 2A, Fall 1975
- Math 22, Chem 36, ChE 220, ChE 230, ChE 232, Non-technical elective

Year 2B, Fall 1975
- Math 31, Chem 36, ChE 211, ChE 231, ChE 233, Non-technical elective

Year 3A, Winter 1976
- ChE 312, ChE 320, ChE 330, ChE 332, ChE 334, Non-technical elective

Year 3B, Winter 1976
- ChE 313, ChE 315, ChE 331, Technical elective, Non-technical elective

Year 4A, Winter 1976
- One of ChE 581, ChE 583 or ChE 585, 3 Technical electives, Technical or Non-technical elective.
Civil Engineering

Civil Engineers plan, design, and supervise the construction of such facilities as bridges, buildings, railways, highways, dams, water supply systems, and waste disposal systems. The demands of society for such facilities are so great that civil engineers spend well over a tenth of our total national income – more money than is spent by any other engineering or professional group.

The curriculum provides a modern approach to the subject based on a thorough grounding in mathematics and natural sciences. Because of the need for a broad understanding of engineering as it relates to society, socio-economic aspects of civil engineering are also included.

Whereas complete professional specialization can be achieved only in postgraduate study and in engineering practice, the student can find opportunity to pursue advanced undergraduate study in a variety of areas. For example:

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

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

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

d) Geotechnical Engineering – is designed to provide the student with an understanding of the engineering properties of soils and enable him to appreciate the methods behind the design of foundations of structures, earth retaining structures, earth dams, and highway pavements.

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

Detailed course descriptions are given in Chapter 16 under the appropriate Departmental sections of this calendar.
f) Hydraulic Engineering – is intended for the student interested in the planning, design and operation of water supply and water resources management.

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

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

### A) Core Programme

**Civil Engineering Core Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
<th>Tutorials</th>
</tr>
</thead>
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### B) Elective Courses

The electives may be selected from the list below in consultation with a Civil Engineering faculty advisor:

- CE 343 Urban Transport Planning 2
- CE 413 Structural Steel Design
- CE 414 Structural Concrete Design
- CE 415 Structural Design 2
- CE 441 Transportation Economics
- CE 454 Foundation Engineering
- CE 481 Engineering Law
- CE 493 Engineering in the Canadian North
- CE 500 Special Project
- CE 501 Approximate Analysis of Structures
- CE 504 Structural Analysis 3
- CE 506 Project Management
- CE 508 Structural Dynamics and Stability
- CE 518 Plates and Shells
- CE 520 Advanced Computer Programming for Engineers
- CE 522 Engineering Analysis
- CE 524 Probability, Statistics and Decision Theory
- CE 525 Introduction to Finite Element Methods
- CE 526 Continuum Mechanics
- CE 534 Model Analysis of Engineering Structures
- CE 536 Model-Aided Design of Engineering Structures
CE 540  Highway Design
CE 541  Traffic
CE 542  Pavement Structural Design
CE 543  Land Use Models
CE 544  Systems Analysis
CE 545  Transportation Planning Practice
CE 551  Engineering Terrain Analysis
CE 558  Soil Engineering (Case Histories)
CE 560  Mechanical Behaviour of Materials
CE 572  Topics in Wastewater Treatment
CE 573  Pollution in the Aquatic Environment
CE 580  Elements of Water Resources Management
CE 583  Water Distribution and Collection Systems
CE 586  Hydrology
CE 589  Open Channel Flow

Appropriate courses offered in other Departments are also available as electives upon the consent of the instructor.

Academic Programme for Each Term (1975-76)

Year 2A
CE 203, CE 204, CE 205, CE 221, CE 265, CE 291†, CE 292, CE 298

Year 2B
CE 200, CE 206, CE 222, CE 224, CE 280, CE 291†, CE 299

Year 3A
CE 303, CE 342, CE 353, CE 381, CE 393, CE 398

Year 3B
CE 300, CE 304, CE 315, CE 354, CE 375, CE 399, Elective

Year 4A
CE 498, Five Electives

Year 4B
CE 400, CE 499, Four Electives

†CE 291 Survey Camp is taken at the commencement of the Fall Term preceding either year 2A or 2B.

Electrical Engineering

The curriculum in Electrical Engineering is designed to teach those fundamental physical and engineering sciences which form the basis of the work of electrical engineers. After the common first year programme in Engineering, the programme in Electrical Engineering consists of twenty core courses and a minimum of nine technical electives (taken during the last two terms): these technical electives include the possibility of working on a design or research project. In addition, students are required to take one non-technical elective course in each of the 2B, 3A and 3B terms and a general elective course in each of the last two terms. A general elective may be either technical or non-technical. During each term they also attend one general seminar course. The department uses a broad interpretation of what constitutes a "non-technical elective".

The normal recommended programme shown below involves a course load (excluding seminar) of five or six courses per term; however, students are allowed to depart from this normal load within the framework of the following rules and within the constraints of the timetable.

The technical programme will consist of a minimum of all twenty core courses and nine technical electives, normally chosen from the listing below (including the possibility of one or two final year project electives). Laboratory exercises are compulsory where they form part of the course.

The non-technical programme consists of one general seminar course (non-credit) covering topics of general interest. Three non-technical electives must be successfully completed; however the mark is not included in the term average. General electives in the last three terms are included in the term average.

A student must carry at least four courses per term (excluding the seminar course), but may carry more at the discretion of the department.

The maximum number of terms of resident study to be as stipulated in the Calendar (viz. ten terms, see page 107).

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 four work terms (including that done in his first year) – unless he is a student admitted to advanced standing, as defined in the Calendar (see page 108).

The student must register his course load at the start of each term. Departmental permission at the time of registration will be required for departing from the normal load in any one term.

Permission to carry more than the normal load in any one term will normally be given only if the student holds an A average in the previous term.

The promotion criteria will be as laid down in the
Faculty rules, (see page 108) and the student will be examined on the basis of the courses for which he is registered at the time of examination.

**Academic Programmes for Each Term (1975-76)**

**Note**

Students may depart from this programme within the framework of the rules given above, and within the constraints of the timetable.

**Term 2A, Fall and Winter**

EE 201, EE 203, EE 205, EE 221, EE 241, EE 233, EE 293

**Term 2B, Fall and Spring**

EE 202, EE 206, EE 271, EE 261, EE 294, ME 50, Non-technical elective

**Term 3A, Winter and Spring**

EE 301, EE 316, EE 317, EE 342, EE 351, EE 362, Non-technical elective

**Term 3B, Fall and Winter**

EE 302, EE 324, EE 352, EE 372, EE 380, General elective

**Term 4A, Fall and Spring**

EE 401, plus 1 General elective, Five Technical electives from: EE 425, EE 427, EE 428, EE 435, EE 446, EE 454, EE 463, EE 473, EE 481, EE 499 A, Math 44

**Term 4B, Winter**

EE 402, plus General elective, Four Technical electives from: EE 426, EE 429, EE 434, EE 436, EE 443, EE 459, EE 464, EE 465, EE 474, EE 482, EE 499 B

**Service Courses**

Mech Eng 2A EE 14 Electromagnetics,
Mech Eng 3A EE 32 Electronic Instrumentation

†General elective is any course that is not a repeat of course material already taken. The undergraduate course descriptions will be found in Chapter 16.

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### Programme
(a) Core (Years 2 and 3)

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<td>EE 233</td>
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<td>EE 261</td>
<td>Energy Processing and Conversion</td>
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<td>EE 271</td>
<td>Electric &amp; Magnetic Fields</td>
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<td>Signal Analysis Methods</td>
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<td>Principles of Digital Computers</td>
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### (b) Technical Electives (Year 4)

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<td>Sound, Noise and Electroacoustics</td>
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With the approval of the Department, students may take technical courses offered by other departments.

### (c) Non-Technical

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Note

The laboratory hours are approximate indications of the average time per week the students will spend in the laboratory.
Mechanical Engineering

The scope of mechanical engineering is so wide and its services so universally needed as a basic part of all kinds of engineering work that the mechanical engineer is in demand in a variety of industries throughout Canada. Mechanical Engineers are required in the field of power generation where they would deal with steam, diesel or other internal combustion engines, and with hydraulic or gas turbines; in the field of heating, ventilating and refrigeration; in the design and manufacture of environmental research equipment, safety equipment, material handling equipment, automobiles, locomotives, aircraft, rockets, marine vessels, furnaces, boilers, pressure vessels, heat exchangers, motors, generators and machine tools. They are employed in industries such as steel production, mining, transportation, communications, oil refining, chemicals manufacture, paper, sugar, textiles, the government, and construction. In the last few years additional demands have been imposed by the requirement that Mechanical Engineers understand and lead in the development of new methods of energy conversion and other technologies of the space age. The undergraduate programme in Mechanical Engineering is designed to provide the student with a firm grasp of the basic fundamentals in the mathematical, physical, chemical and engineering sciences, and also provides an opportunity (on a limited scale) for specialization in the later years. The degree of B.A.Sc. in Mechanical Engineering permits registration as a Professional Engineer in the Association of Professional Engineers of the Province of Ontario upon satisfaction of the work experience requirement and carries exemption from parts 1 and 2 of the Institution of Mechanical Engineers (London) Examination.

Organization of the Mechanical Engineering undergraduate programme is founded on a core of subjects that must be taken by all students. The first year is common with Civil and Electrical Engineering. The second year provides elementary courses in Mechanical Engineering and certain subjects in Electrical Engineering together with further development in mathematics and physics. Opportunities for specialization occur during the third and fourth years, there being a choice of elective subjects available to permit pursuit of individual interests. A coherent set of electives in a particular technical area is termed an Option. Examples of such Options are the following:

a) The Thermodynamics-Fluid Mechanics Option:
The courses in this option deal with a broad range of applications of the principles of thermodynamics and fluid mechanics, with emphasis on topics of industrial significance. Students can structure curricula for specialization in combustion and energy conversion, internal flows with heat and mass transfer, turbomachinery and fluid control systems or for a broader exposure to these and other areas.

b) Solid Body Mechanics and Mechanical Design Option:
The courses offered in this option range from those which provide the mathematical and physical basis of the subject matter through to those which are largely applied. Subjects treated are: mechanics (including vibrations); theories of elasticity, plasticity and fracture; choice of working stress, mechanical design and design optimization. Students taking this option will be prepared for careers in design and development.

c) Production/Industrial Option:
Is designed to provide the student with an understanding of industry from the viewpoint of its organization, its processes, economics and the application of mathematics to its operation. It is suggested for those students primarily interested in the industrial aspects of mechanical engineering.

d) Engineering Materials Option:
Comprehensive series of courses in Physical Metallurgy, Ceramics, Industrial Polymers and Composite Materials offers the necessary versatility for work in Industry and Research.

e) Geophysical (Environmental) Fluid Dynamics Option:
For students interested in the control of air and water pollution and noise abatement, or who wish to embark later on a research career in meteorology, oceanography, ocean engineering, weather modification, pollution problems or related fields.

f) General Mechanical Engineering Option:
The General Mechanical Engineering Option is designed to give the student a general background rather than specialize in any particular option. The course material has been carefully chosen to equip the student for a broad range of Mechanical Engineering practice including research.
### A) Core Programme

#### a) Credit courses

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<td>ME 53</td>
<td>Heat Transfer 1</td>
<td>3</td>
<td>3*</td>
</tr>
<tr>
<td>ME 60</td>
<td>Introduction to Control Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 62</td>
<td>Fluid Mechanics 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ME 82</td>
<td>Mechanical Engineering Projects</td>
<td>0</td>
<td>4½</td>
</tr>
<tr>
<td>ME 560</td>
<td>Instrumentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS 21</td>
<td>Applied Probability and Statistics</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>MS 23</td>
<td>Engineering and Managerial Economics</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>ME 200</td>
<td>Introduction to Mechanical Engineering 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME 300</td>
<td>Introduction to Mechanical Engineering 2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME 400</td>
<td>Introduction to Mechanical Engineering 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME 565</td>
<td>Gas Dynamics 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 566</td>
<td>Turbulent Flow 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 568</td>
<td>Noise Analysis and Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 576</td>
<td>Control System Design</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### B) Elective Courses

#### a) Non-technical electives: Students entering the programme will take four non-technical electives.

#### b) Technical Electives: Eight elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering programme. Each student will complete a two-term Mechanical Engineering Project (ME 82). Electives should be chosen largely from a single option and the choice must be approved by a designated faculty member.

**a) Thermodynamics – Fluid Mechanics Option**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 52</td>
<td>Air Conditioning</td>
</tr>
<tr>
<td>ME 54</td>
<td>Thermodynamics 2</td>
</tr>
<tr>
<td>ME 55</td>
<td>Refrigeration Engineering</td>
</tr>
<tr>
<td>ME 56</td>
<td>Heat Transfer 2</td>
</tr>
<tr>
<td>ME 58</td>
<td>Internal Combustion Engines</td>
</tr>
<tr>
<td>ME 59</td>
<td>Energy Conversion</td>
</tr>
<tr>
<td>ME 62</td>
<td>Fluid Mechanics 2</td>
</tr>
<tr>
<td>ME 64</td>
<td>Industrial Aerodynamics</td>
</tr>
<tr>
<td>ME 555</td>
<td>Thermodynamics 3</td>
</tr>
<tr>
<td>ME 557</td>
<td>Combustion 1</td>
</tr>
<tr>
<td>ME 561</td>
<td>Fluid Control Systems</td>
</tr>
<tr>
<td>ME 562</td>
<td>Control Theory 2</td>
</tr>
<tr>
<td>ME 563</td>
<td>Turbomachines</td>
</tr>
</tbody>
</table>

**b) Solid Body Mechanics and Mechanical Design Option**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 22</td>
<td>Mechanical Design 1</td>
</tr>
<tr>
<td>ME 523</td>
<td>Mechanical Design 2</td>
</tr>
<tr>
<td>ME 525</td>
<td>Mechanical Vibrations</td>
</tr>
<tr>
<td>ME 527</td>
<td>Mechanics of Deformable Solids 3</td>
</tr>
<tr>
<td>ME 528</td>
<td>Experimental Mechanics</td>
</tr>
<tr>
<td>ME 626</td>
<td>Creep, Fatigue and Brittle Fracture</td>
</tr>
<tr>
<td>SD 543</td>
<td>Human Factors Engineering</td>
</tr>
<tr>
<td>SD 544</td>
<td>Ergonomics</td>
</tr>
</tbody>
</table>

**c) Production/Industrial Option**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 41</td>
<td>Manufacturing Science 1</td>
</tr>
<tr>
<td>ME 42</td>
<td>Principles of Machining</td>
</tr>
<tr>
<td>ME 43</td>
<td>Manufacturing Science 4</td>
</tr>
<tr>
<td>ME 45</td>
<td>Manufacturing Science 6</td>
</tr>
<tr>
<td>ME 46</td>
<td>Manufacturing Science 7</td>
</tr>
<tr>
<td>ME 47</td>
<td>Analysis and Design of Manufacturing Systems</td>
</tr>
<tr>
<td>ME 544</td>
<td>Manufacturing Science 5</td>
</tr>
<tr>
<td>ME 548</td>
<td>Numerical Control of Machine Tools 1</td>
</tr>
</tbody>
</table>

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*Credits and grades are approximations and may vary by institution.*
MS 31  Industrial Statistics and Design of Experiments
MS 43  Economics of Enterprise and Benefit/Cost Analysis
MS 44  Industrial Psychology
MS 46  Stochastic Models of Industrial Operations
MS 47  Optimization Models for Policy Analysis
ME 22  Mechanical Design 1
ME 35  Industrial Metallurgy
ME 534  Properties of Polymers
SD 543  Human Factors Engineering
SD 544  Ergonomics

d) Engineering Materials Option
ME 32  Physical Metallurgy 2
ME 33  Materials Science Laboratories
ME 35  Industrial Metallurgy
ME 531  Physical Metallurgy 1
ME 534  Properties of Polymers
ME 537  Ceramics

Suggested electives from other options and departments
ME 22  Mechanical Design 1
ME 41  Manufacturing Science 1 (Plasticity)
ME 43  Manufacturing Science 4 (Casting)
ME 527  Mechanics of Deformable Solids 3
ME 544  Manufacturing Science 5 (Welding)
CE 560  Mechanical Behaviour of Materials

e) Geophysical (Environmental) Fluid Dynamics Options
ME 69  Introduction to the Environment Sciences
ME 566  Turbulent Flow 1
ME 568  Acoustics
ME 570  Geophysical Fluid Dynamics 1
ME 571  Air Pollution 1
ME 572  Ocean Engineering

Graduate courses in this field may also be available to selected undergraduate students.

f) General Mechanical Engineering Option Programme should include all of the following courses:
ME 22  Mechanical Design 1
ME 32  Physical Metallurgy
ME 41  Manufacturing Science 1
ME 54  Thermodynamics 2
ME 528  Experimental Mechanics
ME 563  Turbomachines

Academic Programmes for Each Term (1975-76)

Year 2A, Fall 1975 and Winter 1975
ME 1, MS 21, ME 15, ME 19, ME 12, ME 200, EE 14

Year 2B, Spring 1975 and Fall 1975
ME 3, ME 4, MS 23, ME 20, ME 30, ME 50

Year 3A, Spring 1976 and Winter 1976
ME 5, ME 21, ME 40, ME 51, ME 60, ME 300, 1 Non-technical elective

Year 3B, Fall 1975 and Winter 1976
ME 53, ME 62, EE 32, 3 technical electives

Year 4A, Spring 1975 and Fall 1975
ME 82, ME 400, ME 560, 3 technical electives, 1 Non-technical elective

Year 4B, Winter 1976
ME 44, ME 82, 3 technical electives, 1 Non-technical elective
Systems Design

The Department of Systems Design (formerly the Department of Design) was formed at Waterloo in 1965. Since that time it has received international recognition for its graduate programmes, research activities and design projects.

Within the last decade it has become increasingly apparent that effective solutions to problems involving both society and technology must be based on a broad systems point of view. Not only must the overall technical factors of these problems be carefully considered, but the economic, social, human and political parameters must be given equally careful attention. When large scale problems are under study, few people can be knowledgeable in the complete span of factors and parameters which must be considered. For these cases, solutions must be arrived at by interdisciplinary teams where each member contributes his own special expertise. In order to work effectively on this team, each member needs to be aware of the fundamental systems and design aspects of the problem.

The undergraduate programme in Systems Design Engineering at Waterloo is a study of those basic skills required for system analysis, simulation, optimization and design. Numerous examples may be cited where these systems design fundamentals may be applied: transportation, engineering design, computer applications, production, planning and scheduling, environmental pollution, education, etc. Of course the importance of specialized expertise in these areas should not be minimized, but these skills usually work most effectively toward problem solutions when operating within an overall systems context.

Type of Student

The Systems Design Engineering programme is specifically oriented towards developing graduates who can solve problems lying at the interface of technology and the human environment. It is therefore attractive to those students who are technically oriented and also have a strong parallel interest in social and human problems.

The tools for systems problem solving are becoming more powerful and sophisticated; thus larger and more complex systems may be successfully investigated. Recent developments include an increasing awareness of the theories of communication, progress in the areas of Systems Theory, Human Systems Engineering and Socio-Economic Systems, developments in the theories of Design and Planning and, of course, the tremendous impact of electronic computing systems.

The Systems Design Engineering Programme

The undergraduate programme in Systems Design Engineering encompasses a study of the basic skills required for systems analysis, simulation, optimization and design. In particular the first three years of the programme are intended to provide each student with a broad background and capability in the areas of:

- applied mathematics
- engineering systems and systems theory
- socio-economics systems
- human systems engineering and, computer systems and applications

Throughout these three years the student's ability to grasp real engineering problems is enhanced by an early course in Engineering Design and an intensive experience in the Systems Design Workshop. It is here that a focus is given to the whole curriculum and the student learns to apply lecture material, to develop skills in solving problems that cut across the traditional disciplines, and to develop design, planning and organizational abilities.

The beginning three years of the programme are followed by one year in which the problem-solving capabilities of the student may be applied with emphasis in one particular area of technology, as chosen by the student. This prepares the student for a further year of advanced study to the M.A.Sc. degree if desired, or for a meaningful career in industry or government with the Bachelor's degree.

The general core curriculum of the first three years is given flexibility through two means. Firstly, in each term of the 2nd and 3rd years the student may elect one course freely from any of the offerings of the University, provided only that these courses do not duplicate the core programme. Secondly, in the third year, the student is provided with two additional technical elective courses which serve as precursors to the technical option areas selected for study in the fourth year.

General Description of the Technical Options

The Systems Design Department is offering three well-defined technical options to its students. The technical disciplines encompassed by these options are in areas in which individual faculty members of the department are involved by a procedure for devising special options outside of these areas is outlined below. There is considerable overlap among the disciplines encountered in the various options; indeed, this overlap extends to the objectives of the options in terms of engineering problem solving and design.

In general, it is possible to define technical options for engineering students either through the specific engineering disciplines to which they are oriented or through the special problem-solving skills to which they are directed. The Systems Design options are characterized by an amalgamation of these two points of view. This is emphasized by the continuation of the Systems Design Workshop through the fourth year. At this time each individual student will be required
to attack a major problem taken from his technical option area, but with strong involvement in other disciplines. In addition, each student is encouraged to structure the technical elective courses so that studies include not only the major technical option area but also a "minor" study from a second technological discipline.

Nonetheless, the technical options are named in terms of the major engineering disciplines that they encompass. This has the advantage of identifying the general problem areas which are to be studied in the options, and gives a specific professional identity to the students who choose them.

If a student wishes to select an area not included in the general Systems Design programme, the student may structure a special option with the advice and approval of his/her supervisor. A special option will include a core of four Systems Design courses taken from within any Systems Design option series with an additional four courses which may be taken from well structured options offered outside of the Systems Design department, e.g. water resources, transportation, etc.

Structure of the Options

Each technical option is characterized by a series of option core subjects, and an additional set of technical elective courses. When a student has chosen a particular option he must take all of the associated option core courses. His remaining courses are chosen with the advice of his faculty advisor, in such a way as to strengthen his knowledge of particular facets of the option discipline and to provide for an integrated minor study of a second area. The third and fourth year curriculum is structured as follows:

3A
4 courses Systems Design general core programme
Systems Design Workshop
1 free elective course
1 technical option course, from the option core

3B
4 courses Systems Design general core programme
Systems Design Workshop
1 free elective course
1 technical option course, from the option core

4A
2 Systems Design mandatory courses
Systems Design Workshop
1 free elective course
3 elective courses, at least two from the option core

4B
Systems Design Workshop
1 free elective course
4 technical option courses, at least two from the option core

Design and Human Systems Option

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

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

Problem areas chosen might include:
design for extreme human environments
design where anthropometric aspects are dominant
design of instrumentation for human operators
design problems associated with safety in industry, transportation, etc.
medical design problems involving engineering technology
design involving human engineering
design of consumer products used in recreation and normal living
human aspects of engineering ecology
design of human "micro-environments"
problems of ergonomics and industrial hygiene

Option Core Courses

3A SD341 Problems of Man in the Operational Environment
3B SD366 Aesthetic and Perceptual Aspects of Design
4A SD443 Human Engineering and Rational Design
SD463 Structures and Design
4B Two courses from:
SD542 Human Engineering and Systems Development
SD564 Methodological Processes in Design
SD472 Man-Machine Communications
SD522 Computer-Aided Design 2
SD464 Theory and Applications of Photographic Methods to Measurement and Design

Socio-Economic Systems Option

Many large scale design projects have important socio-economic consequences. Also social and political forces may affect the design process. Under this option a student can study the various interactions between
a project and its social environment; in particular
the aim of this option is to equip the student to attack
problems associated with the design of large-scale
non-corporate systems.
In the option core, techniques are taught for
analyzing this interaction by the use of statistics,
operations research, game theory and the social
sciences. Through his electives a student may pursue
further various topics in the social sciences and
operations research.

Option Core Courses
3A SD333 Experimental Design
3B SD332 Mathematical Programming
4A SD411 Systems Operations 2
   SD433 Conflict Analysis
4B SD412 Topics in Operations Research
   SD432 Analysis of Large Systems

Systems Theory and Computer Option
In this option the student is given the opportunity either
to study in some depth Physical Systems Theory as it
has evolved as a discipline over the last decade or to
gain additional background and expertise in the
application of electronic computers to the analysis,
simulation and design systems.
Those students who study Systems Theory are
expected to be able to apply this theory to problems
involving electrical, mechanical and hydraulic systems
and their combinations. They may also apply the
concepts of Systems Theory to wide varieties of other
systems, involving both engineering and non-
engineering disciplines.
For those students concerned with the applications of
electronic computers the option provides access to
information concerned with computer hardware
(the physical structures of digital, analog and hybrid
computers), computer software (procedural, simulation
and problem-oriented languages), and application
techniques (particularly in computer-aided design).

Option Core Courses
3A SD353 Time Domain Models for Physical Systems
3B either SD324 Principles of Digital Computers
   or SD352 Algorithms for Computer-Aided Systems
   Analysis
4A SD521 Analog and Hybrid Computing Systems
   SD451 Multi-Terminal Representations and
   Piecewise Analysis of Physical Systems

4B Two courses from:
   SD522 Computer-Aided Design 2
   SD452 Introduction to Linear Control Systems
   SD454 Hydraulic Systems
   SD456 Power Systems

Free Electives and Technical Electives
In each term of the second, third and fourth years the
Department of Systems Design requires each student
to study one course outside of the core programme.
These free elective courses gives the opportunity to
devise a coherent, "minor" study in an area of the
student's own choice or to provide a sample of courses
from a number of differing fields. The intent of this
free elective programme is to allow the student to
broaden his own education in the manner most suitable
to his own needs; there is no restriction regarding the
departments from which free elective courses may
be chosen.
In the third and fourth years a student in Systems
Design has, in addition, a total of eight technical
elective courses. Most of these form the core of the
student's chosen option area while the remainder are
chosen by the student to provide insight into particular
applications of the option discipline.
In all cases elective course selections are subject to
approval by the department.

1A
(Fall Term)
SD111 Calculus 1
SD113 Linear Algebra
SD121 Digital Computation
SD131 Engineering Economics
SD161 Systems Behaviour
SD181 Statics
SD183 Graphics and Design

1B
(Spring Term)
SD112 Calculus 2
SD114 Theory and Applications of Probability
SD142 Introduction to Ergonomics
SD162 Systems Design Methodology
SD182 Dynamics
SD184 Electricity and Magnetism
SD192 Systems Design Laboratory 1

2A
(Winter Term)
SD211 Applicable Mathematics for Systems Design 1
SD213 Theory and Applications for Statistics
SD221 Numerical Analysis and Computation
SD261 Systems Design Workshop 1
SD281 Mechanics of Deformable Solids
SD291 Systems Design Laboratory 2
1 free elective

2B
(Fall Term)
SD212 Applicable Mathematics for Systems Design 2
SD252 Physical Systems 1
SD262 Systems Design Workshop 2
SD264 Form and Function in Design
2 courses chosen from:
SD282 Thermodynamics
SD284 Fluid Mechanics
SD286 Introduction to Biochemical and Polymer Systems
1 free elective

3A
(Spring Term)
SD311 Systems Operations 1
SD351 Physical Systems 2
SD361 Systems Design Workshop 3
SD381 Materials Engineering
SD391 Systems Design Laboratory 3
1 technical elective
1 free elective

3B
(Winter Term)
SD322 Computer Simulation of Systems
SD362 Systems Design Workshop 4
SD364 Manufacturing Science
SD382 Applied Electronics
SD392 Systems Design Laboratory 4
1 technical elective
1 free elective

4A
(Fall Term)
SD421 Computer-Aided Design 1
SD431 Economics of Engineering Design
SD461 Systems Design Workshop 5
3 technical electives or 2 technical electives and 1 free elective

4B
(Winter Term)
SD462 Systems Design Workshop 6
4 technical electives
1 free elective

Option Core Courses
Design and Human Systems Option:
3A
SD341 Ergonomics of Special Environments
Socio-Economic Systems Option:
SD333 Experimental Design
Systems Theory and Computer Option:
SD353 Time Domain Models for Physical Systems

3B
Design and Human Systems Option:
SD366 Aesthetic and Perceptual Aspects of Design
Socio-Economic Systems Option:
SD332 Mathematical Programming
Systems Theory and Computer Option:
either SD324 Principles of Digital Computers or SD352 Algorithms for Computer-Aided Systems Analysis

4A
Design and Human Systems Option:
SD443 Human Engineering and Rational Design
SD463 Structures and Design
Socio-Economic Systems Option:
SD411 Systems Operations 2
SD433 Conflict Analysis
Systems Theory and Computer Option:
SD521 Analog and Hybrid Computing Systems
SD451 Multi-Terminal Representations and Piecewise Analysis of Physical Systems

4B
Design and Human Systems Option: Two courses from:
SD342 Human Engineering and Systems Development
SD564 Methodological Processes in Design
SD472 Man-Machine Communications
SD522 Computer-Aided Design 2
SD464 Theory and Applications of Photographic Methods to Measurement and Design
Socio-Economic Systems Option:
SD412 Topics in Operations Research
SD432 Analysis of Large Systems
Systems Theory and Computer Option:
Two courses from:
SD522 Computer-Aided Design 2
SD452 Introduction to Linear Control Systems
SD454 Hydraulic Systems
SD456 Power Systems

Notes
The numbering of Systems Design courses is as follows:
a) If the course is given in the "A" term, the number in the units place is odd. Otherwise, it is even.
b) The number in the 10's place refers to the field of the subject matter of the course, according to the following codes:

1 topics in mathematics required for Systems Design
2 computer systems
3 socio-economic systems
4 human systems
5 physical systems
6 the design of engineering systems
7 human communication systems
8 engineering sciences
9 laboratories
c) The number in the 100's place refers to the year in the programme in which the student will encounter the course. The only exception is that courses in the 500 series are available to fourth year students.

The majority of Systems Design courses are given on the basis of three formal lectures and one tutorial hour each week. The department endeavours to ensure that the formal course schedule remains below 25 hours per week in each term. Beyond this, other, less formally scheduled meetings between students and faculty are required. It is expected that the average student will spend, in total, between 55 and 65 hours per week on his studies.

Department of Management Sciences

Activities and Scope
The Department of Management Sciences, Faculty of Engineering, was established in 1969, as a graduate department and has recently extended its activities to undergraduate programmes.

The present activities of the department are:
(1) the pursuit of advanced research in selected fields of the management sciences, (2) the provision of post-graduate courses of instruction for people who want to achieve high professional qualifications, and (3) the provision of undergraduate courses in the management sciences for students registered in the Faculty of Engineering.

Active faculty engagement in advanced research as well as experience in professional practice is considered essential to the development of adequate courses of instruction. The boundaries between pure research, applied research and professional practice become indistinct when the aim is to discover imaginative new ways to solve complex management problems. The research activities of the faculty members fall into three major categories: operations research, applied economics, and organizational behaviour. A major aim of the Department is to strengthen and develop these major fields of study.

Undergraduate Programmes
At the present time the Department is involved in two major activities in undergraduate teaching: i) a Management Sciences Option involving four MS courses; ii) Production/Industrial Engineering Option (jointly with the Department of Mechanical Engineering). Students completing courses in either of these options may be eligible for admission with advanced standing to the Department's M.A.Sc. programme.

Management Sciences Option
The Department offers a programme option consisting of a package of four MS courses for students registered in any undergraduate programme in the Faculty of Engineering. The main objectives of this programme are to provide an awareness of the nature of managerial problems, to present some of the issues, concepts, and techniques related to these problems and to motivate the students to learn scientific approaches to management. Although the courses emphasize practical problems, rigorous theoretical and conceptual approaches are presented.

The structure of the four course package is based on an appreciation of the complexity of management problems and the importance of being introduced to the different principles, considerations and approaches of tackling them. In a programme of this nature, it is considered advantageous to have an overall appreciation of the nature of the problems rather than dealing, in some depth, with only a few of them. Therefore, the programme is intended to introduce several approaches and different considerations in relation to managerial decision making. Enrolment in these courses will normally start in term 3B and will be primarily for engineering students who will take all four courses offered.

Production/Industrial Engineering Option
This option, offered jointly with the Department of Mechanical Engineering, provides the student with an understanding of (industrial) organizations in terms of their processes, behavioural and economics dimensions and the use of mathematical models in the design and control of operations.
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 (B.E.S.), and a Bachelor of Architecture (B.Arch). At the graduate level a Master of Arts (M.A.) and a Ph.D. Degree may be obtained in both Geography, and Regional Planning and Resource Development. In addition, the Geography and Man-Environment Studies Departments offer joint honours programmes with many other departments in the University (see programmes for other details).

Degrees may be obtained in the following programme areas:
B.E.S. – Pre-Professional Architecture (3 years), on rotating work/study co-operative scheme.
B.Arch. – Professional Architecture (2 years, with co-operative work terms following completion of B.E.S. Pre-professional Architecture).
B.E.S. – Honours Geography (4 years).
B.E.S. – Major in Geography (3 years).
B.E.S. – Honours Man-Environment Studies (4 years).
B.E.S. – Honours Urban and Regional Planning (4 years).
M.A. – Geography.
M.A. – Regional Planning and Resource Development.
Ph.D. – Geography.
Ph.D. – Regional Planning and Resource Development.

The student should choose the unit most suited to his 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 Department of Geography or the Department of Man-Environment Studies is relatively easy. Transfer to the School of Architecture is not normally permitted above Year 1, except where the applicant has done acceptable work at another approved School of Architecture. Transfer to the School of Urban and Regional Planning is not normally permitted above Year 2.

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

Applicants from Ontario Year 5
Because of the increasing use of statistics and quantitative methods in environmental research it is recommended, but not required, that students present at least one Year 5 Mathematics course for admission to programmes in Environmental Studies. Year 5 Geography is similarly recommended for those applying to the Geography Department. For applicants to the School of Architecture, Functions and Relations, Calculus, Physics, and English at the Year 5 level are required.
Applicants – Other Than Ontario Year 5
Applicants in this category should refer to Chapter 2 of this Calendar for general University admission requirements. Furthermore, applicants to the School of Architecture must show equivalent proficiency to Ontario Year 5 applicants in the areas of Mathematics, Physics and English.

Interviews
Students being seriously considered for admission to the Schools of Architecture and Urban and Regional Planning are normally required to participate in an interview as part of the admissions process. For Architecture, a test will be conducted by the School during interviews to establish ability to comprehend the various thematic areas.

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

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

Registration
September 2, 3, 4, 5, 1975.

Fees
Refer to Chapter 3 page 29.

Examinations and Standings

The following regulations govern the practice of the Faculty of Environmental Studies in regard to final examinations, standing, and make-up examinations. These regulations also apply to part-time students and special programmes.

Students should note that the Faculty of Environmental Studies operates under a "course system" in which student progress is measured by courses successfully completed rather than by years. Students who have passed fewer than five courses will be considered Year 1 students; those who have passed at least five courses but fewer than ten will be considered Year 2 students; those with at least ten but fewer than 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 for 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 i) 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; ii) must have secured the permission of the professor concerned.

d) Appeals against faculty decisions made under these regulations may be made in writing to the Undergraduate Affairs Committee of the faculty through the appropriate Undergraduate Affairs Officer. The form of examination is at the discretion of the individual faculty member. Where final written examinations are required they are held in December, April, or August. Oral examinations may be required at the discretion of individual departments. The normal duration for written examinations is three hours.

2) Standing

a) Standing in an individual subject is determined by combining the marks assigned for term work with those obtained in the final examination. For the purpose of grading, the University Grading System described on Page 16 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 plus those courses which are given the Environmental Studies designation.

e) To be considered in good standing in the Honours programmes, a student must maintain a cumulative overall average of at least B- (70.0) as well as an average of at least B (73.0) in the chosen field of specialization (unless otherwise specified in a departmental Honours programme). If an Honours programme candidate's average falls below the prescribed minimum, the individual can be given conditional standing if in the opinion of the School or Departmental Promotions Committee the person can attain Honours standing before graduation. If not, the student, upon request, will be considered a candidate for a degree in the General Geography Programme and the regulations in (d) below will apply.

d) To be considered in good standing in the General Geography programme, a student must maintain a cumulative overall average of at least C- (60.0) as well as an average of at least C (63.0) in the chosen field of specialization. If at any time a student's average falls below C- (60.0) or the average in the field of specialization below C (63.0), the individual will be granted conditional status for one year, during which period he/she must make reasonable progress toward obtaining good standing or he/she will be asked to withdraw. A student whose cumulative overall average falls below D (53.0) many continue only with the permission of the Undergraduate Affairs Committee.

e) The only general programme in the faculty is the General Geography Programme. The B.E.S. programme in the School of Architecture is a pre-professional programme. A regular (full-time) student in the General Geography Programme must in each academic year enrol in at least five courses, but in not more than seven. Students may be enrolled for reduced programmes after obtaining the approval of the appropriate Undergraduate Affairs Officer.

f) 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.

g) A student who has been required to withdraw for academic reasons may be eligible to apply for re-admission after one year's absence.

3) Additional Regulations, School of Architecture Examinations and Promotions

To pass from one term to the next in the B.E.S. and B.Arch. programmes it is necessary for the student to:

1) obtain an overall cumulative average of (65.0). (Term promotion from 2A through to 3B will require an overall cumulative average of 70.0 each term).

2) pass the studio course. If any studio course (Arch. 192, 193, 292, 293, 392, 393, 492, 493, 592, 593) is failed, the student may not proceed to the studio course of the next term, until the studio course is passed.

3) fail not more than two half courses in any single term; a minimum passing grade in any course is D-.

Normally students of the School are permitted to take only one more or one fewer half-course (academic weight 0.50) than that prescribed for the particular year and term registered in. Any further addition or reduction to the student's programme must be approved by the Undergraduate Officer of the School of Architecture.

The following procedures have been set out for those students who have not met the above conditions.

Supplemental Examinations

A student failing any Architecture course with an F+ standing has supplemental examination privileges and may take such an examination as arranged in accordance with University policy.

Incomplete Marks

Students receiving an Incomplete standing in any prerequisite Architecture core subject during any given term, must clear up this deficiency before being permitted to take the respective follow-up course. If an Incomplete standing is received in any Architecture elective subject, the student has up to 11 months to clear this deficiency. However, any Incomplete standing whether core or elective, not cleared within the 11 month period, will automatically be converted to a grade of F-.

Appeals

Appeals against School decisions concerning grades and promotions made under these regulations may be submitted in writing to the Chairperson of the Appeals Committee of the School. The Appeals Committee sits once each term, and the student is advised to contact the School as soon as possible to determine the next sitting of the Appeals Committee.
Academic Programmes
A student who has not determined in what field or subject he/she wishes to concentrate should study the Calendar carefully. After examining the suggested departmental programme, the student should read the descriptions of individual courses in order to have a more comprehensive idea of what the content of any programme would include. The student should consult his/her High School Guidance Officer, Chairperson or Undergraduate Officer of any University department, or the Registrar, by letter or in person for additional clarification and information.

Course and Programme Changes
a) Students may add and drop half courses during the first three weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.

b) Students may add and drop full-year courses during the first three weeks of the Fall term upon having the appropriate change form completed.

c) After these periods, students will be allowed to add courses only with the permission of the instructor and the appropriate undergraduate officer and upon completing the appropriate change form.

d) After these periods, students enrolled in more courses than their programmes require may, upon having the appropriate change form completed, with the signature of the appropriate undergraduate officer, drop courses to reduce their programmes to the specified minimum up to but not later than four weeks prior to the end of lectures in the courses being dropped.

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

f) A course that has not been dropped officially (i.e. recorded in the Registrar's Office) prior to the last four weeks of lectures in that course will receive a grade and be counted in the student's average.

The calendar is designed to enable students to make a wise choice of their programmes and courses while at the University of Waterloo. However, it is a complex document often difficult to understand and in all cases of confusion students are encouraged to consult the undergraduate officer of the appropriate School or Department. The Secondary School Liaison Officer and the Assistant Registrar for Environmental Studies will also respond to written or personal inquiries.

The following statement outlines the objectives and nature of the four programmes in the Faculty of Environmental Studies.

Environmental Studies Courses
Some courses are offered in the Faculty of Environmental Studies under an Environmental Studies heading. These courses are integrative in nature and extend across the academic interests of the four units. They are ES 195* - Introduction to Environmental Problems; ES 200* - Field Ecology; ES 252* - Media Tools for Environmental Studies; ES 253* - Media Tools for Environmental Studies - Advanced Level; ES 358* - Environmental Pollution and its Control; ES 380*/381* - Environmental Studies Workshop; ES 400 - Environmental Law. Detailed course descriptions are given in Chapter 16 of the Calendar under the heading Environmental Studies.
School of Architecture

Nature of the Programme

Architecture, traditionally, is the art, science and technique of modifying the physical environment to satisfy the needs and aspirations of people. The School, therefore, endeavours to engender in the student of architecture an awareness of the need to understand the diverse, dynamic and, often, contradictory demands of a society and its individuals.

Equally stressed, is the need to comprehend the implications of those demands in relation to the existing environment. That is, the School also endeavours to foster in the student of architecture an acceptance of responsibility for the influence of his/her action upon the environment he/she modifies and the realization that, in so doing, the student requires consultation and collaboration with others of a variety of disciplines involved in the study of human ecology.

The intention of the programme of study is to impart to the student of architecture an understanding of a process of responsible environmental modification for man's use and to enable the student, as an architect, to contribute to that process. This requires a broad base for architectural studies and promotes an inter-disciplinary approach to studies in the University and especially, within the Faculty of Environmental Studies. The full, five-year programme in Architecture is intended to prepare the student to become an architect capable of practice within contemporary professional constraints and capable, too, of adaptation to a changing profession and society it serves.

The School of Architecture offers two undergraduate programmes: a pre-professional, three-year Bachelor of Environmental Studies programme and a two-year professional programme of study for the Bachelor of Architecture degree. Both programmes are on the co-operative system which consists of alternating periods of academic study and practical work experience.

Degrees

The pre-professional architecture programme comprises six academic terms of study and three, four-month co-operative work terms* leading to the degree, Bachelor of Environmental Studies (B.E.S.). This degree indicates appropriate preparation for four subsequent academic terms of study and two co-operative work terms*, one of four months and one of eight months, leading to the degree, Bachelor of Architecture (B.Arch.).

*See section in this chapter on Co-operative Programme.

Non-Architecture Students

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

Bachelor of Environmental Studies

(Pre-Professional Architecture Programme)
The purpose of the pre-professional B.E.S. programme is to educate future architects to an understanding of the beliefs and needs of the individual and of society, and to a willingness to take an active role in creating and improving the environment; to a clarification of the interaction of seemingly unrelated disciplines, and to know the principles and values that surround the creation of any artifact; to a comprehension of the many forms of creative expression; and to an understanding of the present as part of a historical process. The programme helps the student to predict the effect of science, technology and man's creations on the environment, and to understand that continuing studies will help the future architect to become sensitive to the needs of mankind in a never-ending cycle of change. The programme is founded on four broad study themes.

1) the design studio, theories and methods, and a workshop for application and experimentation of theories.

2) Studies of systems and measures including computer, physical and material sciences.

3) cultural history in the human environment.

4) environmental studies, including natural and human ecology.

See Recommended Core Programme for course arrangement, page 137.

See Chapter 16 of the Academic Calendar for course descriptions.

Bachelor of Architecture Programme

The purpose of the Bachelor of Architecture programme is to permit a student who has successfully completed the Environmental Studies (Pre-professional Architecture) degree or equivalent to pursue, in parallel with a prescribed design studio programme, courses of study selected by the student and appropriate to his/her capabilities and interests. The final two terms of the programme are normally devoted to the undertaking of a studio project problem selected and programmed by the student. Students' presence is required at studio courses.

Note

Students are expected to defray costs of materials in connection with studio projects.
See Recommended Core Programme for course arrangement, page 137.

See Chapter 16 of the Academic Calendar 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, one four months and one eight months.

Note
The "off-term" in the Bachelor of Environmental Studies pre-professional programme follows the first two terms of study (from September to April) in Year 1. A student may use the "off-term" as a vacation period or he/she may seek temporary employment. Any employment arrangements made for the "off-term" are the student's own responsibility.

The terms are arranged as indicated on the following charts.

Class Terms Chart

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Objectives of the Work Term
The co-operative work terms are designed to provide the student with knowledge of present day practice in architecture and to develop within the student practical skills essential for the practising architect today.

Work opportunities are developed in private architectural practices, corporate and government 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.
### Recommended Core Programme for the Degree of Bachelor of Environmental Studies

**Theme Areas**

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<th>Term</th>
<th>1 (A)</th>
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**Note**
- Bold blocks indicate elective courses; see section on electives.
- (TE) Theme elective in the same theme area with Department approval (see section on electives).
- (FE) Free elective with Department approval (see section on electives).
- This indicates as shown in the small squares the credit value of the course.

### Recommended Core Programme for the Degree of Bachelor of Architecture

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<th>Term</th>
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- (FE) Free elective with Department approval (see section on electives).
- This indicates as shown in the small squares the credit value of the course.
Department of Geography

Nature of the Programme
Geography is concerned with both the natural and man-made environment, studying how man has shaped it according to the human need, how patterns of human activities are structured over space, and how these are influenced by environmental factors. Geography is considered both a natural and social science and flourishes in an academic organization where the multi-disciplinary approach is emphasized. The Bachelor of Environmental Studies (B.E.S.) programme in Honours Geography provides students with almost unlimited freedom to choose supporting electives from across the whole University. Thus, in consultation with professors, every student will be able to have a tailor-made programme to suit his/her particular needs, whether he/she is primarily interested in physical or human geography, regional or systematic topics, or a combination of these. The Department has Joint Honours programmes with a number of other departments on campus.

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

In the programme there is emphasis on both the development of theory and methodology and on practical application of geographical concepts to the economic, social and political problems of Canada and other parts of the world. The "applied geography" aspects of the programme are enhanced by the availability in the faculty of elective courses in Urban and Regional Planning and Man-Environment Studies given by the faculty with academic and practical experience in urban and regional planning, resource management, conservation, and environmental design.

Many graduates of the geography programme proceed to further graduate work or jobs in education, in government, industry and planning agencies.

Although the programme is broad in scope, it permits a student to specialize in one of three major aspects of the discipline: applied physical, economic-urban, or cultural-regional geography. Advanced elective courses are available in each of these three streams, and further concentration is possible by careful selection of courses from related fields in other parts of the University.

The programme is liberal in that the only requirement other than the core of Geography courses is that five of the elective courses be taken outside the Faculty of Environmental Studies. These may be taken all in one discipline or in a variety of disciplines.

Students should note that geography courses are open to any student in the University wherever prerequisites are met. Students taking the geography programme in the Faculty of Arts will receive a B.A. (Bachelor of Arts) degree and those in the Faculty of Environmental Studies will receive a B.E.S. (Bachelor of Environmental Studies) degree.

The Department of Geography has both Master's (M.A.) and Ph.D. graduate programmes. At the graduate level the course work and research is concentrated on some specific subfield of Geography. The Department's areas of research specialization include applied physical geography, air photo interpretation and remote sensing, urban and economic geography, agricultural geography and rural development, regional planning and development, resources management and Europe.

Bachelor of Environmental Studies
(Honours Geography Programme)

Undergraduate Geography Courses

Note 1
All courses are open to any student from any Faculty or School of this University whenever prerequisites are met.

Note 2
The Department of Geography offers General and Honours programmes both in the Faculty of Arts (B.A.) and the Faculty of Environmental Studies (B.E.S.). Joint honours programmes with most subjects in the University may be arranged subject to approval. Some examples of such programmes may be seen under the Faculty of Arts programme section earlier in the calendar.

Note 3
The letter R designates courses given through Renison College.

Note 4
Geog. 101* and Geog. 102* are given in both fall and winter terms. It is immaterial which of these courses is taken first as neither is sequential to the other.

Honours Geography

Year 1
Geography 102* Introduction to Physical Geography
and one but no more than three of:

Geography 101* Introduction to Human Geography
Environmental Studies 195* Introduction to Environmental Problems
Geography 110* Tutorial in Geography
Geography 125R* Introduction to the Developing World
Geography 126R* The Emerging “Third World”
Geography 127* Regional Problems of Europe

Plus additional credits chosen after consultation with the department so that the student has 6 full course credits. Note that all of these courses (except Geography 110*) are available to any student in the University.

Year 2
Environmental Studies 200* Field Ecology
Geography 201* Some Basic Topics of Physical Geography
Geography 202* Some Basic Topics of Economic and Urban Geography
Geography 260* Introduction to Cartography and Map Analysis
Geography 275* Introductory Air Photo Analysis and Remote Sensing
Geography 271* Introduction to Quantitative Research Methods

and one of:

Geography 203* Some Basic Topics of Cultural and Regional Geography
Geography 232* Geography of Population
Geography 320 World Regional Geography

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

Year 3
Geography 391* Field Research
Geography 381* The Nature of Geography
Two course credits of geography electives
Two course credits chosen after consultation with the Department

Year 4
Geography 490 Senior Honours Research Essay
and additional course credits so that a student should have a minimum of 21 full course credits

Note 1
While twenty-one full course credits is the minimum required for the degree of Bachelor of Environmental Studies (Honours Geography) students may take an enriched programme of up to twenty-four course credits maximum.

Note 2
The minimum and maximum number of full course credits in geography courses in the programme are nine and thirteen unless a student takes an enriched programme in which case the additional electives may all be in Geography.

Note 3
Students must take a minimum of five full course credits in Faculties other than the Faculty of Environmental Studies.

Note 4
To enter Year 2 of the Honours Geography programme, a student must achieve in Year 1 a minimum overall average of B— 70.0) and an average of B (73.0) in his Geography and Environmental Studies courses. In subsequent years, a student must continue to achieve an overall average of B— (70.0) and an average of B (73.0) in Geography and Environmental Studies courses.

Note 5
It is recommended that all honours students specialize at third and fourth year levels. The department offers specialized streams in (a) Applied Physical Geography (b) Economic Geography (industrial resources, rural, and urban aspects) (c) Regional/Cultural Geography. Additional courses in areas of specialization can be obtained from other disciplines in University.

Note 6
Since many departments doing graduate work in Geography demand proficiency in a foreign language, students intent on graduate work should consider taking a foreign language in their first year.

Note 7
Students intending to teach in Secondary Schools are advised to take at least two course credits (or equivalent) of Regional Geography courses.

Note 8
This programme prepares students for graduate study in Geography or in Planning, for entry to Secondary School teaching, or for research positions in industry and government.

Note 9
All Geography students are encouraged to take summer employment which will provide experience useful to a geographer. Where possible, the Department will provide information and assistance in securing such summer employment.

Note 10
For some courses, participating students may be expected to make a small financial contribution to
defray heavy equipment/travel costs, e.g. Geog. 391* (Field Camp), which is mandatory for all third year honours students.

Joint Honours
Joint Honours programmes have been arranged between Geography and several other disciplines in the University. Detailed programmes have been worked out with Anthropology, Biology, Canadian Studies, Earth Sciences, Economics, English, German, History, Man-Environment Studies, Mathematics, Political Science and Russian. These programmes lead to the degrees of the Faculty in which the student is registered, providing always that in addition to the requirements of the specific programme the general requirements of that faculty have been met. For the programmes already approved, depending on the student's registration, the following degrees may be awarded:

<table>
<thead>
<tr>
<th>B.E.S. or B.A.</th>
<th>Joint Geography with:</th>
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<tbody>
<tr>
<td></td>
<td>Anthropology,</td>
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<td>Canadian Studies,</td>
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<td>Economics, English,</td>
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<td>German, History,</td>
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<td>Political Science,</td>
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<td>Man-Environment Studies,</td>
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<td>Russian</td>
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<table>
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<tr>
<th>B.E.S. or B.A.</th>
<th>Mathematics</th>
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<td>or B.Math.</td>
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<table>
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<tr>
<th>B.E.S. or B.Sc.</th>
<th>Earth Sciences</th>
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</table>

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

Students enrolled in these programmes are required to obtain at least seven course credits in Geography with the exception that five are required in the joint programme with Earth Sciences; those intending to qualify for the Type "A" certificate for teaching secondary school require a minimum of nine course credits in Geography.

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

Geography Minor for Honours Students in Other Faculties
The requirements are the same as those noted for the General Geography Programme.

General Geography Programme

Year 1
Geography 102* Introduction to Physical Geography
and one of, but not more than three of:

- Geography 101* Introduction to Human Geography
- Environmental Studies 195* Introduction to Environmental Problems
- Geography 110* Tutorial in Geography
- Geography 125R* Introduction to the Developing World
- Geography 126R* The Emerging "Third World"
- Geography 127* Regional Problems of Europe
- Four course credits selected in consultation with the Department. (Note that all of these courses except Geog. 110*) are available to any student in the University.)

Year 2
Environmental Studies 200* Field Ecology
Geography 201* Some Basic Topics of Physical Geography
Geography 202* Some Basic Topics of Economic and Urban Geography

one of:

- Geography 203* Some Basic Topics of Cultural and Regional Geography
- Geography 232* Geography of Population
- Geography 320 World Regional Geography
- and additional credits so that a student should have completed by the end of second year 10 full course credits.

Year 3
Geography 381* The Nature of Geography
One and one-half courses of Geography electives
Three courses selected in consultation with the Department.
Note 1
Fifteen course credits is the minimum requirement for the degree of Bachelor of Environmental Studies (General Geography). However, an enriched programme of up to eighteen course credits may be arranged.

Note 2
A minimum of five geography course credits constitutes a Geography Major but up to eight geography course credits may be taken in this programme. Students taking an enriched programme may choose additional geography electives.

Note 3
Students must take a minimum of four course credits in Faculties other than the Faculty of Environmental Studies.

Note 4
Students must maintain an overall average of C—(60.0) with an average of C (63.0) in their geography courses.

Department of Man-Environment Studies

Nature of the Programme
Man-Environment Studies is a four year honours degree programme oriented towards study of the many dimensions of human interrelationships with various environments including natural and managed landscapes, buildings and cities, small groups, communities and whole societies. Through problem and issue oriented enquiry into such complex 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 B.E.S. degree in Man-Environment Studies have found employment in a range of government agencies in fields such as natural resources management, pollution control, social services planning, and urban affairs as well as with private corporations and consulting firms in the communications industry and environmental design; with other universities as full-time teaching or research assistants, and with community agencies in various social programmes and as community organizers. Others who have graduated from man-environment studies have gone on to post-graduate work in programmes such as urban and metropolitan studies, natural resources administration, regional planning, environmental engineering, law, systems design, teacher training, adult education, and communications studies.
The Department is unique in having a multi-disciplinary faculty whose formal education and experience range over a number of disciplines in the natural sciences, social sciences and the fine arts. They bring to the programme qualifications in fields such as anthropology, agriculture, biology, chemistry, chemical engineering, communications science, earth sciences, economics, fine arts, geography, mathematics, physics, planning, political science, psychology, sociology and social work, as well as a variety of experience in such diverse areas as the planning of education systems, ecological research, geological investigations, economic studies, urban affairs, technology assessment, and work with various international organizations.

For the approach used in Man-Environment Studies, considerable academic innovation has been necessary. Besides lectures and labs, the programme uses modular instruction units; student-selected projects and community work; field trips to environments other than lecture halls; team teaching; a regular flow of visitors from outside the University; and workshop instruction to help develop techniques and skills relevant to environmental studies. Although there are no formal arrangements for a co-operative programme in Man-Environment Studies, students are encouraged to relate aspects of their academic programme to summer and other employment or to involvement in community organizations in order to incorporate this experiential learning into a university-based educational process.

For many students a "theme" oriented programme of this kind offers a more satisfying undergraduate education than additional alternatives. Man-Environment Studies started at Waterloo in 1969 and as an undergraduate degree programme it is unique in Canada although similar ones have become established in the United States, Europe and Australia.

Bachelor of Environmental Studies (Honours Man-Environment Studies)

About one half of the 22 courses required for the B.E.S. degree are designated as a core of required courses. The remainder are free electives chosen by each student to develop the mix of subjects and skills best suited for achieving individual educational or career preparation objectives.

Most required courses are taken in the first two years. The first year introductory courses examine major environmental themes from the viewpoints of the natural and social sciences. They also introduce techniques for investigating environmental questions and provide experience in conducting a systematic enquiry through the device of small group projects. In the second year, further work in natural ecology and social sciences helps to introduce other perspectives and themes running through man-environment studies such as a systems mode of understanding relationships and the "futures" implications of the problems considered. Additional course work on information or data handling is required and each student also conducts an individual or group project selected from a wide range of possible topics and problem areas.

The core requirements for years three and four are also project-oriented, comprising a "seminar-workshop" and senior honours assignment respectively. Arrangements to receive extra credit for project work have been provided for those who learn most effectively through undertaking self-directed work under the guidance of faculty and other advisors. The fourth year also requires participation in one from among several honours seminars which provide the occasion for students to draw together much they have learned and direct it to one of the broad sub-areas within man-environment studies.

The stress given to project-oriented learning within the programme reflects the importance attached to having students develop increasingly sophisticated abilities for coping with situations that are inherently complex, value-laden, ambiguous and uncertain. Project-oriented learning provides the occasion to practice skills in problem definition, information and data gathering, analysis and synthesis of material, and presentation of results in a suitable format using the most appropriate communications media. Skills of this nature can be refined, adapted and applied in whatever context or situations students choose during and after their university years. An increasing number of students incorporate work with government agencies, community organizations and other groups into projects they select for their third and fourth year project assignments and in a few cases, well conceived and executed projects have lead to employment in a variety of organizations.

Elective courses can be chosen from anywhere in the university and options start from the first year in the programme. Faculty will advise on this, but essentially there are four broad options as follows:

a) Students may combine Man-Environment Studies with one academic discipline to the extent that some form of a joint honours degree can be awarded. Arrangements to do this have been approved with seven other academic programmes in the university and more are being considered. Students interested in this type of option should make certain they consult with the Undergraduate Officer.

b) Students may concentrate study in an associated field to the extent it becomes a "minor" (5 full courses or equivalent) within honours Man-Environment Studies.

c) Students may develop a coherent sequence of courses from electives offered by the department in combination with courses offered elsewhere to concentrate on one of several possible sub-areas emerging within man-environment studies, i.e. human and community
studies, resource and environmental management, policy and decision-making at the interface of technology and society.

d) Students may choose instead to explore whatever range of subjects interest them in addition to Environmental Studies.

In each case students should give careful consideration to their choices in terms of the educational goals and possible careers they may wish to pursue after obtaining a B.E.S. degree. They would also do well to seek information and advice on the kind of undergraduate courses favoured by different graduate programmes either as absolute prerequisites for them or expressed preferences.

The Honours Programme requires a minimum of six full credits or the equivalent per semester for the first two years and five full credits or their equivalent per semester in the third and fourth years. Each student must have completed twenty-two full credits or the equivalent before graduation with a cumulative overall average of B—(70.0); a major average of B (73.0) must be maintained in the required courses.

The programme is as follows:

**Year 1**

M-Env 120 (Y) Environmental Issues and the Natural Sciences
M-Env 130 (Y) Environmental Issues and the Social Sciences
M-Env 150 (Y) Environmental Issues: Methods and Techniques
M-Env 190 (Y) Seminar-Workshop
Electives: Two full credits: Four half-year courses or equivalent

**Year 2**

Env.S. 200* Field Ecology
M-Env 241* Social Change, or other half-year course in social sciences
M-Env 271* Introduction to Quantitative Research Methods, or one other introductory methods course approved by the Department (see Undergraduate Officer)
M-Env 290 (Y) Seminar-Workshop
Electives: Three and one-half full credits or equivalent (i.e. seven half-year courses)

**Year 3**

M-Env 390 (Y) Seminar-Workshop (credit value can be increased to 2 by consent of Faculty)
Electives: Three or four full credits or equivalent (i.e. six or eight half-year courses)

**Year 4**

M-Env 490 (Y) Senior Honours Assignment (credit value can be increased to 2 or 3 by consent of Faculty)
One of the following Honours Seminars:
M-Env 410 (Y) Environmental Management
M-Env 445 (Y) Technology Assessment and Policy Analysis
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, German and Slavic Languages and Literature (for Russian), Philosophy, Political Science, Psychology, 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 vacation period if opportunities are available. 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 learnings 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.
<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>Plan 100 – Introduction to Urban Planning Concepts and Techniques</td>
<td>One-half credit from each of the eight categories in the list of Year 1 Required Elective Courses (see below)</td>
<td>Plan 159* – Graphics for Planning</td>
<td>Students may select other electives from any of the University Year 1 offerings — Required and Elective Courses together must total 6 credits</td>
</tr>
</tbody>
</table>

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>Subject</th>
<th>Course</th>
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<tbody>
<tr>
<td><strong>Ecology</strong></td>
<td>Biol 131 Introduction to Biology</td>
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<td></td>
<td>Earth 130 Introductory Geology</td>
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<td></td>
<td>Geog 102* Introduction to Physical Geography</td>
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<td></td>
<td>Sci 100* Geological Foundations of the Environment</td>
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<tr>
<td><strong>Administration</strong></td>
<td>PSci 101* Introduction to Politics 1</td>
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<tr>
<td></td>
<td>PSci 102* Introduction to Politics 2</td>
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<tr>
<td><strong>Design</strong></td>
<td>Arch 142* Iconography 1</td>
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<td></td>
<td>Arch 194* Visual Interdisciplinary Language</td>
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<td></td>
<td>Arts 100* Communications</td>
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<td></td>
<td>Engl 108* B Utopia and Anti-Utopia</td>
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<td></td>
<td>Fine Arts 120* Fundamentals of Visual Art 1</td>
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<tr>
<td></td>
<td>Fine Arts 150G* Introduction to Music 1</td>
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<td></td>
<td>Plan 159* Graphics for Planning</td>
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<tr>
<td><strong>Habitat</strong></td>
<td>ES 195* Introduction to Environmental Problems</td>
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<td></td>
<td>Geog 101* Introduction to Human Geography</td>
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<td></td>
<td>Rec 100* Introduction to the Study of Leisure and Recreation</td>
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<td><strong>Methodology</strong></td>
<td>Engl 140* The Use of English 1</td>
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<td>Fr 101* Elementary French</td>
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<td>GenE 113* Engineering Measurement</td>
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<td>GenE 120* Engineering Synthesis</td>
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<td></td>
<td>Math 100 Fundamental Concepts of Modern Mathematics</td>
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<td></td>
<td>Math 132a Introduction to Computer Science — Programming</td>
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<tr>
<td><strong>Sociology</strong></td>
<td>Soc 101* Introduction to Sociology (Planning Section)</td>
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<tr>
<td><strong>Economics</strong></td>
<td>Econ 101* – Introduction to Economics</td>
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<tr>
<td></td>
<td>Econ 102* – Introduction to Economics</td>
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<tr>
<td><strong>Philosophy</strong></td>
<td>Arts 120G* Focal Issues in Contemporary Society</td>
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<td>Arts 121G* Focal Issues in Contemporary Society</td>
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<td>Engl 108* B Utopia and Anti-Utopia</td>
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<td>Engl 108* H Isolation and Alienation</td>
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<td>History 101R* Western Civilization</td>
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<td>History 105* The Meaning of Civilization</td>
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<td>Phil 110 Problems</td>
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<td>Phil 125* Fundamentals of Social and Political Philosophy</td>
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<td>Phil 140* Fundamentals of Logic</td>
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<td>Phil 150* Knowledge and Reality</td>
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### Environmental Studies
School of Urban and Regional Planning

<table>
<thead>
<tr>
<th>Year</th>
<th>Required Planning Courses</th>
<th>Required Elective Courses</th>
<th>Elective Planning Courses</th>
<th>Other Electives</th>
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<tr>
<td><strong>Year 2</strong></td>
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<td></td>
<td>ES 200* – Field Ecology</td>
<td>One full credit from list of Required Elective Courses (see following page)</td>
<td>Plan 222* – Canadian Regional Issues</td>
<td>Required and Elective Courses together to total 6 full credits</td>
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<tr>
<td></td>
<td>Plan 256 – Principles of Environmental Design</td>
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<td>Plan 230* – The Small Group in the Planning Process</td>
<td>List of “Non-Planning Suggested Electives” obtainable from Undergraduate Officer</td>
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<tr>
<td></td>
<td>Plan 271* – Introduction to Quantitative Research Methods</td>
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<td>Plan 258* – Readings and Research in Planning</td>
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<td>Plan 307* – Social Survey Techniques</td>
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<td>Plan 272* – Computer Programming in Environmental Studies</td>
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<td>and at least 2 of:</td>
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<td>Plan 255* – Planning Surveys and Analysis</td>
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<td>Plan 358* – Regional Planning and Development</td>
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<td>Plan 357* – Conservation and Resource Management</td>
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| **Year 3** | Plan 300 – Seminar/Workshop Project in Urban and Regional Planning | Two full credits from list of Required Elective Courses (see following page) | Plan 301* – Planning Design | |
| | Plan 391* – Field Research Methods and Projects | | Plan 316* – Multivariate Statistics | |
| | | | Plan 317* – Nonparametric Statistics | |
| | | | Plan 318* – Spatial Analysis | |
| | | | Plan 319* – Regional Planning Techniques | |
| | | | Plan 330* – Urban Social Planning | |
| | | | Plan 332* – The Sociology of Regions | |
| | | | Plan 333* – The Sociology of Regional Planning | |
| | | | Plan 344* – Principles of Recreation Planning | |
| | | | Plan 360* – Technology in Urban and Regional Planning | |
| | | | Plan 370* – Land Development Planning | |

<p>| <strong>Year 4</strong> | Plan 456 – Political and Administrative Processes in Urban and Regional Planning | One full credit from list of Required Elective Courses (see following page) | ES 400 – Environmental Law | |
| | Plan 480 – The Philosophy and Methodology of Urban and Regional Planning | | Plan 414* – Housing Policies | Required and Elective Courses together to total 6 full credits |
| | Plan 490 – Senior Honours Essay (2 full course credits) | | Plan 430* – Social Policy Planning | List of “Non-Planning Suggested Electives” obtainable from Undergraduate Officer |
| | | | 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 | |</p>
<table>
<thead>
<tr>
<th>Year 2-4 Required Elective Courses</th>
<th>Urban Theme</th>
<th>Regional Theme</th>
<th>Resource Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>These courses are subject to availability</td>
<td>These courses are subject to availability</td>
<td>These courses are subject to availability</td>
<td></td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td><strong>Plan 230</strong> The Small Group in the Planning Process</td>
<td><strong>Plan 222</strong> Canadian Regional Issues</td>
<td><strong>Plan 222</strong> Canadian Regional Issues</td>
</tr>
<tr>
<td></td>
<td><strong>Plan 272</strong> Computer Programming in Environmental Studies</td>
<td><strong>Plan 230</strong> The Small Group in the Planning Process</td>
<td><strong>Plan 230</strong> The Small Group in the Planning Process</td>
</tr>
<tr>
<td></td>
<td><strong>Anth 247</strong> Urban Anthropology</td>
<td><strong>Plan 272</strong> Computer Programming in Environmental Studies</td>
<td><strong>Plan 272</strong> Computer Programming in Environmental Studies</td>
</tr>
<tr>
<td></td>
<td><strong>Geog 201</strong> Some Basic Topics of Physical Geography</td>
<td><strong>Geog 201</strong> Some Basic Topics of Physical Geography</td>
<td><strong>Geog 201</strong> Some Basic Topics of Physical Geography</td>
</tr>
<tr>
<td></td>
<td><strong>Geog 202</strong> Some Basic Topics of Economic and Urban Geography</td>
<td><strong>Geog 202</strong> Some Basic Topics of Economic and Urban Geography</td>
<td><strong>Geog 202</strong> Some Basic Topics of Economic and Urban Geography</td>
</tr>
<tr>
<td></td>
<td><strong>Geog 251</strong> Urban Areas in North America</td>
<td><strong>Geog 270</strong> Introduction to Cartography and Air Photo Interpretation</td>
<td><strong>Geog 270</strong> Introduction to Cartography and Air Photo Interpretation</td>
</tr>
<tr>
<td></td>
<td><strong>Sci 250</strong> Environmental Geology</td>
<td><strong>Sci 250</strong> Environmental Geology</td>
<td><strong>Sci 250</strong> Environmental Geology</td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td><strong>Plan 301</strong> Planning Design</td>
<td><strong>Plan 301</strong> Planning Design</td>
<td><strong>Plan 301</strong> Planning Design</td>
</tr>
<tr>
<td></td>
<td><strong>Plan 330</strong> Urban Social Planning</td>
<td><strong>Plan 316</strong> Multivariate Statistics</td>
<td><strong>Plan 333</strong> The Sociology of Regions</td>
</tr>
<tr>
<td></td>
<td><strong>Plan 360</strong> Technology in Urban and Regional Planning</td>
<td><strong>Plan 317</strong> Nonparametric Statistics</td>
<td><strong>Plan 333</strong> The Sociology of Regions</td>
</tr>
<tr>
<td></td>
<td><strong>Plan 370</strong> Land Development Planning</td>
<td><strong>Plan 318</strong> Spatial Analysis</td>
<td><strong>Plan 333</strong> The Sociology of Regions</td>
</tr>
<tr>
<td></td>
<td><strong>Arch 303</strong> Economics</td>
<td><strong>Plan 319</strong> Regional Planning Techniques</td>
<td><strong>Plan 333</strong> The Sociology of Regions</td>
</tr>
<tr>
<td></td>
<td><strong>Civ E 342</strong> Urban Transport Planning 1</td>
<td><strong>Plan 332</strong> The Sociology of Regions</td>
<td><strong>Plan 332</strong> The Sociology of Regions</td>
</tr>
<tr>
<td></td>
<td><strong>Civ E 393</strong> Environmental Engineering</td>
<td><strong>Plan 333</strong> The Sociology of Regional Planning</td>
<td><strong>Plan 333</strong> The Sociology of Regional Planning</td>
</tr>
<tr>
<td></td>
<td><strong>Econ 357</strong> Environmental Economics</td>
<td><strong>Plan 344</strong> Principles of Recreation Planning</td>
<td><strong>Econ 357</strong> Environmental Economics</td>
</tr>
<tr>
<td></td>
<td><strong>Geog 349</strong> The City as a System 1</td>
<td><strong>Plan 360</strong> Technology in Urban and Regional Planning</td>
<td><strong>Geog 300</strong> Geomorphology and the Southern Ontario Environment</td>
</tr>
<tr>
<td></td>
<td><strong>Geog 350</strong> Regional Urban Systems 1</td>
<td><strong>Civ E 343</strong> Transportation Engineering</td>
<td><strong>Geog 301</strong> Climatology</td>
</tr>
<tr>
<td></td>
<td><strong>PSci 343</strong> Urban Politics 1</td>
<td><strong>Econ 335</strong> Economic Development</td>
<td><strong>Geog 356</strong> Resources Management</td>
</tr>
<tr>
<td></td>
<td><strong>Soc 360</strong> Political Sociology</td>
<td><strong>Econ 357</strong> Environmental Economics</td>
<td><strong>Rec 302</strong> Travel and Tourism</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 4</th>
<th><strong>Plan 414</strong> Housing Policies</th>
<th><strong>Plan 430</strong> Social Policy Planning</th>
<th><strong>ES 400</strong> Environmental Law</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Plan 430</strong> Social Policy Planning</td>
<td><strong>ES 400</strong> Environmental Law</td>
<td><strong>Geog 410</strong> Recreation Geography</td>
</tr>
<tr>
<td></td>
<td><strong>Plan 470</strong> Concepts and Ideas in Contemporary Urban Planning</td>
<td><strong>Geog 412</strong> Advanced Economic Geography 2</td>
<td><strong>Geog 411</strong> Resource Studies</td>
</tr>
<tr>
<td></td>
<td><strong>ES 400</strong> Environmental Law</td>
<td><strong>Geog 422</strong> Canada</td>
<td><strong>Geog 452</strong> Problems of Rural Land Use</td>
</tr>
<tr>
<td></td>
<td><strong>Arch 554</strong> Development and Financing</td>
<td><strong>Geog 452</strong> Problems of Rural Land Use</td>
<td><strong>Geog 460</strong> Land Dereliction and Rehabilitation</td>
</tr>
<tr>
<td></td>
<td><strong>Civ E 543</strong> Land Use Models</td>
<td><strong>PSci 428</strong> State and Economic Life</td>
<td><strong>M-Env 431</strong> Comparative Approaches to Environmental Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Civ E 543</strong> Land Use Models</td>
<td><strong>Rec 434</strong> Park Management</td>
</tr>
</tbody>
</table>
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
To enter Year 2 of the Honours Planning Programme, a student must obtain a minimum overall average of B– (70.0) and a B (73.0) in Planning and Environmental Studies courses and must obtain credit standing in 6 full courses. In subsequent years, a student must maintain a cumulative, overall average of B– (70.0) as well as an average of B (73.0) in Planning and Environmental Studies courses.

Note 2
Planning 156* (Fall and Winter terms) and Planning 342* and 343* are intended for students in other disciplines and may not be taken for credit by Planning students.

Note 3
If Planning 159* Graphics for Planning is taken as an elective in Year 1, then Geography 275* Introductory Air Photo Analysis and Remote Sensing may be taken in place of Geography 270* Introduction to Cartography and Air Photo Interpretation in Year 2.

Note 4
Students interested in the Political Science electives: Pol. Sci. 330 and 340 are advised to first complete an introductory course from Po. Sci. 101*/102*, or Pol. Sci. 260.

Note 5
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 6
Planning 307* may be taken in Year 2 or Year 3.

Note 7
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 8
Not all the courses listed below are offered each year. Students should consult the School prior to registration.

Note 9
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 10
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).
Study of human movement
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). It is composed of three departments: The Department of Kinesiology and Recreation administer the academic and research programmes, and the Department of Athletics conducts programmes of 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. Four years ago a regular stream was added to the Co-operative programme to enable students who wanted the programmes but not the co-operative aspects to attend the University of Waterloo. The Regular programme has grown to the point where it equals the Co-operative programme enrollment. 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 or Recreation in which they had a special interest. 1975 will see even greater opportunities for study by the individual students.

Kinesiology Programme

The Kinesiology programmes are multi-dimensional studies of human physical movement incorporating the biological, physical, and social sciences. Extensive laboratory facilities enable the students in the programme to be among the few undergraduate students in the world to examine first hand the problems adherent within human physical activity.

A General programme was added in 1973, as were two streams for concentration: Kinesiological Sciences, and Applied Kinesiology. Freshman students need not concern themselves with these channels, as all first year students enrol in Honours Kinesiology.

Two distinct Honours Options are also available within the Department. Students may enrol directly into the Dance, or the Health Studies Options. Both programmes are outlined in the Faculty undergraduate brochure. All students within the Department are permitted to take some electives in the other areas.

The Kinesiology programmes are designed to provide graduates with maximum flexibility in choosing a career. Graduates are already found in a variety of agencies ranging from teaching (the Honours programme meets all requirements for admission to the Type “A” Certificate courses in Physical and Health Education at the Colleges of Education in Ontario), to hospitals for the aged, infirm, retarded, and psychiatric populations, fitness institutes, sports equipment manufacturing outlets, YM-YWCA's, youth centres, university teaching and/or graduate programmes, and related fields.

Recreation Programme

The academic programme in Recreation has been designed to give each graduate the body of knowledge necessary to prepare for a professional position in the field of Recreation. Students completing the Honours Degree programme can, in addition, complete course sequences resulting in a declared option in Recreation Administration, Therapeutic Recreation Services, Outdoor Recreation and Education, or Leisure Studies. A Joint Honours Programme with Sociology is available as is a Recreation-Business Option with Wilfrid Laurier University.

Graduates of the Recreation Degree Programme are found in diverse settings, including hospitals, municipalities, schools, national and provincial parks, youth agencies, and university graduate programmes. All are eligible to apply for the Municipal Recreation Directors' Interim Type "A" Certificate from the Sports and Recreation Branch, Ministry of Community and Social Services.

Degrees

Graduates of all Kinesiology programmes will receive either an Honours or General Bachelor of Science degree in Kinesiology. Recreation programme graduates are awarded an Honours Bachelor of Arts degree in Recreation.

Graduates of the Co-operative Programme who successfully complete 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 gives the student an opportunity, unique in Canada, to gain experience in many career fields open to Kinesiology and Recreation graduates. Graduates of the Kinesiology programme are looking towards careers in the following areas: fitness, fitness testing and programme development, sports medicine, equipment design, testing and sales, fine and gross motor skill development and remediation, physical education, coaching, design of prosthetics, physical (rehabilitation) medicine, and research.

In Health Studies students are capable of performing in such career areas as Public Health, Community Health Education, Teaching and Research.

Students in Recreation have career interests in the following areas: Municipal Recreation and Administration, Therapeutic Recreation, Outdoor Recreation and Education, Commercial Recreation, Industrial Recreation, Leisure Studies, and Research.
Arrangements for work assignments are made through the Department of Co-ordination of the University which provides the liaison between the campus and the field. Students should refer to Chapter 6 of the Calendar for further details concerning the co-operative programme.

All Year 1 students enrol in September. Precise dates for the beginning and end of each year of the other terms are shown in the academic calendar for the year. The eight terms of study and six terms of employment provided in the course are arranged as shown in the following diagram:

<table>
<thead>
<tr>
<th>1975</th>
<th>1976</th>
<th>1977</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Winter</td>
<td>Fall</td>
</tr>
<tr>
<td>First</td>
<td>Second</td>
<td>Work</td>
</tr>
<tr>
<td>Term</td>
<td>Term</td>
<td>Third</td>
</tr>
<tr>
<td>Winter</td>
<td>Winter</td>
<td>Spring</td>
</tr>
<tr>
<td>Term</td>
<td>Term</td>
<td>Fourth</td>
</tr>
<tr>
<td>Term</td>
<td>Term</td>
<td>Work</td>
</tr>
<tr>
<td>Term</td>
<td>Term</td>
<td>Term</td>
</tr>
</tbody>
</table>

Regular System
The regular programme consists of eight academic terms in a period of four years. All courses are offered in the Fall and Winter terms. Students in all programmes usually enrol in September, though a few begin in other terms.

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

Application from Ontario Year 5
Applicants to any of the Kinesiology programmes are advised to select a Year 5 programme which includes one or more of the following courses: Calculus, Biology, Chemistry, Physics.

Applicants to the Recreation programme are advised to include both Geography and Biology in the Year 5 programmes.

Adult Students
Adult students are also advised to take the courses indicated above, or their equivalent.

Advanced Standing
In unusual circumstances advanced standing may be granted for entry into Year 3 or 3A. All transfer students will be required to complete at least the equivalent to two years of study (i.e. at least 10 full year courses) regardless of the number of full year courses that are presented.

Examinations and Standings
The Faculty of Human Kinetics and Leisure Studies currently operates under a “course system” in which student progress is measured by courses successfully completed rather than by years. Students who have passed fewer than 12 term courses will be considered Year 1; those who have passed at least 12 term courses but fewer than 22 will be considered Year 2; those with at least 22 but fewer than 32, Year 3; and those with 32 or more, Year 4.

1) Final Examinations
a) The faculty constitutes the examining body for all examinations. All examination results are considered by the Undergraduate Affairs Committee and subsequently by the Faculty Council. The results are issued to individual students by the Registrar. Appeals against faculty decisions made under these regulations should be made in writing to the Chairman, Undergraduate Affairs Committee within one month of publication of the official mark reports.

b) In all courses each student is required to submit in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during the term are used, in part, in determining standing. The ration in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass in a course, a student must obtain a minimum of D- in the combined term and examination marks. At the discretion of the chairman of the department concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of his instructor. Some courses and/or instructors may not require final examinations; in such cases term work only will be used in determining a final grade.

c) Students defaulting examinations, except for properly certified reasons, do not have make up privileges, and must repeat the entire course. If a student has a Doctor's certificate covering the precise period of absence, with legitimate medical grounds, it must be submitted to the Chairman of the Undergraduate Affairs Committee within one week of the scheduled examination.

d) All examinations which receive a failing grade are automatically re-read.
2) Standing

a) The Faculty has endorsed the letter grade system outlined on page 16 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>(Dance Option)</td>
<td>C-</td>
<td>C-*</td>
</tr>
<tr>
<td>(Health Studies Option)</td>
<td>C-</td>
<td>C-*</td>
</tr>
<tr>
<td>Kinesiology General</td>
<td>D-</td>
<td>C-</td>
</tr>
<tr>
<td>Recreation Honours</td>
<td>C-</td>
<td>B-</td>
</tr>
</tbody>
</table>

*All courses designated Kinesiology, Health Studies and Dance will be included in the major average.

If a student fails to meet either of the above required cumulative averages the person may be designated on probation for the following year. A General student on probation must improve his/her standing to at least the minimum overall level noted or else will be required to withdraw from the Faculty. An Honours student on probation may elect to transfer to the General programme in good standing (if this is possible) or may endeavour to improve the Honours average to the cumulative minimum required; if such improvement is not forthcoming such a student may be transferred to the General programme. An Honours student on probation may be required by the student's major Department to repeat certain courses which have been done poorly or may elect to do so himself in order to improve performance in subsequent years.

If a regular (full-time) student, even in good standing, fails more than two full-year courses or their equivalent in a given year the student may be transferred to the General programme or else may be asked to withdraw if the Department feels he is not making satisfactory progress towards a degree. Students thus asked to withdraw may be eligible to apply for re-admission only after a one year's absence. Students asked to withdraw after the equivalent of two "years" in Conditional or "Failed" standing (here or elsewhere) will normally not be re-admitted.

c) Programme selection:

Full-time students: All first year students must take a minimum of 12 term courses. In subsequent terms, a student will normally take at least 5 courses.

Part-time studies or reduced programmes: Except in exceptional circumstances, an Honours programme may not be taken on a completely part-time or reduced programme basis; at least seven academic terms must be taken on a full-time (full programme) basis and no student may spend more than 5 years of full-time study (10 terms) for an Honours degree. The Faculty of Human Kinetics and Leisure Studies does not encourage part-time studies but will allow the General degree to be pursued on a part-time or reduced-programme basis subject to approval by the Associate Dean (Undergraduate Affairs) and the Department concerned. Normally, no first year programme for a full-time student may be reduced below the 12 course minimum except in very exceptional circumstances.

Course and Programme Changes

a) Students may add and drop half courses during the first three weeks of the beginning of the term upon having the appropriate change form completed.

b) After these periods, students will be allowed to add courses only with the permission of the instructor and the appropriate associate chairman and upon completing the appropriate change form.
Academic Programmes
Department of Kinesiology

Listed below are the course combinations leading to the Honours and General degrees in Kinesiology and the Honours Degrees in Dance and Health Studies. Students are encouraged to make full use of the advisory system of the Department in planning their programmes.

Degree Requirements Honours and General Programmes


b) Required courses from other departments:
Physics 103* or Physics 104* (see note), Biology 110*, 303* and 304*, Psychology 101*, Sociology 101* and one other Sociology or Psychology.

Note
In the case of Physics 103*, Physics 104* and Biology 110* students may elect to take full year courses in either subject in the appropriate department. Physics 103* is for students not presenting Year 5 Physics for admission. Physics 104* is for students who have taken Year 5 (Grade 13) Physics.

c) Kinesiology electives: ten (10) courses from those offered in the Department in addition to the required courses.

1) Honours Programme
Each student must include in his/her programme at least seven (7) courses from one of the following two areas of concentration:


Note
Kinesiology 346*, 353*, 354*, 410*, 452*, and 453* are common to both areas.

2) General Programme
The ten (10) elective courses in Kinesiology may be made up of any combination of Kinesiology, Health Studies and/or Dance courses.

d) Electives: The remaining thirteen term courses required for the degree are to be elected as follows:

1) Eight (8) term courses must be elected in departments outside the Faculty of Human Kinetics and Leisure Studies.

2) The remaining five term courses may be taken in any department of the University including Kinesiology and Recreation.

Course Sequence – Honours and General Programmes
Year 1
(Common to Regular and Co-operative Programmes)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 102*</td>
<td>Kin 103*</td>
</tr>
<tr>
<td>Psych 101*</td>
<td>One of Psych or Soc</td>
</tr>
<tr>
<td>Soc 101*</td>
<td>Biol 110*</td>
</tr>
<tr>
<td>Phys 103*</td>
<td>Kin 116*</td>
</tr>
<tr>
<td>or Phys 104*</td>
<td>(if no Year 5 Chemistry)</td>
</tr>
<tr>
<td>Two electives</td>
<td>Two or three electives</td>
</tr>
</tbody>
</table>

Co-operative Programme

<table>
<thead>
<tr>
<th>Term 2A</th>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 200*, 222*</td>
<td>Kin 321*, 330*, 335*</td>
<td></td>
</tr>
<tr>
<td>Two electives</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 3A</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 355*</td>
<td></td>
</tr>
<tr>
<td>Biol 304*</td>
<td></td>
</tr>
<tr>
<td>Three electives</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term 4A</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 431*</td>
<td></td>
</tr>
<tr>
<td>Five electives</td>
<td></td>
</tr>
<tr>
<td>Four electives</td>
<td></td>
</tr>
</tbody>
</table>

Regular Programme

Year 2 Fall

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 200*, 222*</td>
<td>Kin 321*, 335*</td>
</tr>
<tr>
<td>Biol 303*</td>
<td>Biol 304*</td>
</tr>
<tr>
<td>Two electives</td>
<td>Two electives</td>
</tr>
</tbody>
</table>

Year 3 Fall

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 300*, 317*, 330*</td>
<td>Kin 355*</td>
</tr>
<tr>
<td>Two electives</td>
<td>Four electives</td>
</tr>
</tbody>
</table>

Year 4 Fall

<table>
<thead>
<tr>
<th>Fall</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kin 431*</td>
<td>Kin 432*, 470*</td>
</tr>
<tr>
<td>Five electives</td>
<td>Four electives</td>
</tr>
</tbody>
</table>
Honours Health Studies

Students may apply for admission directly into the Honours Health Studies programme, co-op or regular.

44 term courses

Degree Requirements

b) Required Kinesiology courses: Kinesiology 200*, 222*, 300*, 317*, 330*.


d) Electives: Seventeen (17) term courses selected in consultation with the student's advisor.

Health Studies Year 1 Common
HS 140*                          HS 141*
Psych 101*                       Psych 211*
Soc 101*                        Kin 116* (if necessary)
Biol 131                        Biol 131
Two electives                   Two (or Three) electives

Regular Programme Year 2
Year 2
HS 240*                          HS 241*
Kin 200*, 222*                   Biol 246*
Biol 245*                       Three electives
One elective

Year 3
Fall
HS 349*, 410*                   HS 345*, 346, 348*
Kin 330*, 317*                   Biol 304*
Biol 303*                       One elective

Year 4
Fall
HS 431*, 440*                   HS 432*, 445*
Kin 300*                         Four electives

Co-operative Programme

Year 2
2A Fall
HS 240*                          HS 345*, 348*
Kin 200*, 222*                   Kin 330*
Biol 245*                       Two electives
Biol 303*

2B Spring
HS 435*, 440*                   Kin 330*
Biol 304*                       One elective
Two electives

Year 3
3A Winter
HS 241*                          HS 410*, 440*
Biol 246*                       Kin 300*, 317*
Biol 304*                       One elective
Two electives

3B Fall
HS 435*, 440*                   Kin 300*, 317*
Biol 304*                       One elective
Two electives

Year 4
4A Spring
HS 349*, 346*, 431*             HS 432*, 445*
Four electives
**Honours Dance**

Students may apply for admission directly into the Honours Dance programme (regular only).

44 term courses.

**Degree Requirements**

a) Required Dance Courses: 162*, 163*, 262*, 264*, 362*, 460*, 461*, 462*, 463*, 464*, and two others to be developed.


d) Elective Courses in Dance: six term courses.

e) Electives: the remaining term courses must include at least seven term courses taken outside the Faculty of Human Kinetics and Leisure Studies.

**Note**

*This programme is to be phased in over a two-year period during which the additional courses required will be developed. Under consideration at this time are the following:*

- **Dance 363***: Dance Ethnology
- **Dance 364***: Creativity and Movement
- **Dance 466***: Performance and Production (Modern Dance)
- **Dance 467***: Performance and Production (Ballet)

Additionally there are courses offered in other departments, notably Recreation and Psychology, as well as courses in Kinesiology, which are being considered for cross-listing as Dance courses. This would augment the elective series without additional staffing.

**Academic Programmes**

**Department of Recreation**

Forty-four term courses are required for the Honours degree in Recreation. The student begins study in one of the four areas of concentration available in the second year of the programme. Double Honours programmes with other departments are being developed. For information about these programmes, please consult the Department of Recreation.

**Degree Requirements**

A) Recreation courses:

1) **Required:**


   b) Each student normally must include in his programme the courses listed in one of the following areas of concentration (see note):

   - **Leisure Studies:** Recreation 200*, 301*, 302*, 306*, 361*.
   - **Therapeutic Recreation:** Recreation 200*, 252*, 253*, 254*, 361*.
   - **Recreation Administration:** Recreation 316*, 320*, 334*, 410*, 434*.
   - **Outdoor Recreation:** Recreation 330*, 332*, 334*, 432*, 434*.

   **Note**

   In exceptional cases, with departmental advice and approval, other course combinations may be developed to meet specific educational goals.

2) **Electives:**

Each student must complete 4 additional recreation electives to meet the required total of 21.

B) **Courses outside the Department of Recreation:**

1) **Required:**

Geography 101*, of Environmental Studies 195*, Planning 156*, Psychology 101*, English 140/141, Science 351*, Sociology 101*, Plus 8 additional term courses chosen in consultation with a faculty advisor with regard to area of concentration.
2) Electives:

Each student must select at least 8 term courses from any Department of the University.

C) Additional Requirements:

Practical Experience. To complete the requirements for a degree, all students must complete a faculty approved work term, normally of at least three months duration, or successfully petition the Department for exemption on the basis of experience.

Course Sequence (Co-operative and Regular)

Year 1
Recreation 100*, 101*, 220*, 230*, 250*
Geography 101* or Environmental Studies 195*
Planning 156*
Psychology 101*
English 140/141
Science 351*
Sociology 101*

Year 2
Recreation 210*, 270*, 271*
2 Recreation electives
6-8 electives

Year 3
Recreation 300*
5 Recreation electives
5 electives

Year 4
Recreation 400*, 470*, 471*
2 Recreation electives
5 electives

Students enrolled in the programme prior to September, 1972 have different course requirements from the above. Such students must complete 18 recreation courses, 8 electives, and 18 required courses outside the Department or their equivalent.

Honours Recreation and Sociology
A Joint Honours programme is available in Recreation and Sociology. Interested Recreation students should consult with their departmental faculty advisor for details.

Honours Recreation and Business
A Joint Honours programme is available in Recreation and Business with Wilfrid Laurier University. Interested Recreation students should consult with their departmental faculty advisor for details.
Programme of Integrated Studies
Campus Scene
Programme of Integrated Studies

An Alternative in University Education

Integrated Studies, a small (less than 100 students) undergraduate programme, is a unique and exciting opportunity for students interested in creating their own individual university programmes. It allows them to pursue a project or theme approach to their education moving across normal disciplinary lines without any course requirements.

Students must be sufficiently motivated to work independently and have the maturity to direct their own studies. The wide resources of the University, including its full array of courses, are available. But the students decide what their programmes require; that might mean taking no formal courses at all, or perhaps auditing several and taking only one for credit, or other variations. They might work with professors from the University's departments, or the Resource Persons hired by Integrated Studies, or graduate students, using them as tutors in the development of their basically independent programmes. In addition, most find their fellow students to be of valuable assistance. The choice of resources is the students'

Here are some examples of current study areas: drama as a system of education; the development of electronic equipment used in the study of the brain; education concentrating on alternative schooling; abnormal behaviour and physiology; underdeveloped nations and the variable determinants in their evolution; communications as a systems model and as a design problem.

The emphasis in the programme is on the students' own evaluation of their learning development. Accordingly, the only yearly requirement is a review presenting a detailed account of the students' educational programmes.

While some of the student programmes last only a year or two (this is an excellent opportunity to explore a particular but limited interest), an increasing number of students are working toward their Bachelor of Independent Studies (B.I.S.) degree.

How is the degree obtained? Students desiring the Bachelor of Independent Studies degree apply to the Academic Board for Integrated Studies. The Board, consisting of faculty of the University, appoints academic supervisors, in consultation with acceptable applicants, to work with them during the final two academic terms. At the end of this time, the supervisors submit an evaluation of the students' work to the Board for its review and degree recommendation to the Senate of the University.

What does one do with a B.I.S. degree? Graduates have gone on to teachers' college, graduate study, employment with the government and a variety of other opportunities. While their unorthodox backgrounds have posed some problems for normal bureaucratic processes, most have found their studies a decided advantage in continuing to explore their interests.

Integrated studies is administered by its Operations Council, consisting of all members of the programme, its students, Resource Persons and administrative staff. The Council is responsible for the day to day operation of the programme subject to the approval of the Vice President, Academic, of the University. This includes such items as budget development, recommendations for the hiring of personnel, admission of students, and year end reviews. The Council normally meets every second week and functions through advisory committees.

Integrated Studies offers an exciting, alternative approach to University education. If you desire such an alternative, and feel you are capable of handling its demands, you are urged to meet with the people currently involved in its operation. In addition, members of Integrated Studies would be happy to visit schools or groups of students to discuss the programme.

The admission requirements and procedures for all programmes are outlined in detail in Chapter 2 of this calendar.

While general University admission standards are applicable to Integrated Studies, consideration is given to those not possessing these minimum requirements. Applicants are admitted on the basis of a personal interview. Those showing the strongest aptitude for self direction and the ability to flourish in an unstructured academic setting are given first consideration.

Full admission procedure information may be obtained by writing directly to the Assistant Registrar for Integrated Studies.
Inter-Faculty Studies

Inter-Faculty Studies courses and programmes are offered by the Inter-Faculty Programme Board of the University of Waterloo. It was felt that the University should offer a number of broadly structured courses and programmes covering wide areas and designed not so much to prepare students for further work in a concentrated area or discipline as to contribute more generally to their educational development.

The Board, whose membership is broadly representative of Faculties and Colleges, sponsors both multidisciplinary courses and thematic programmes available as electives to students through the University. In addition, the Board sponsors, from time to time, seminars, colloquia, and lectures on topics of broad general interest to the University at large.

Courses offered by the Inter-Faculty Programme Board are intended to enrich existing University offerings, to provide a multi-disciplinary context within which students may deal with fundamental issues and problems confronting today's world, and to foster co-operation and awareness of others' interests and goals among the various members (students and professors alike) of the University community.

How may the University student himself contribute to solutions to urgent social problems? What tools are available to enable one to cope with the mass of information and pseudo-information encountered in the communications media? What are the dominant issues facing man today? How does one determine values appropriate for man in today's world? How can human conflict be resolved in a non-violent way? How is social justice to be achieved through social planning? In what ways can leisure contribute to the future of mankind? What, after all, is the nature of man?

These questions and issues provide the basis of the Inter-Faculty Studies courses. A listing and description of each course can be found in the Course Description section of this calendar. In addition, the Inter-Faculty Programme Board has initiated and sponsored a thematic programme in Communication Studies. With the co-operation of the Faculties of Arts, Engineering and Environmental Studies, the Inter-Faculty Programme Board offers the Communication Studies Programme which brings students and faculty from several disciplines together in a study of communication processes.

The study of multi-media communication, sociocultural analysis, decision and value theory, technological communication systems, mass communication processes, inter-cultural communication, information diffusion and utilization, advocacy processes and social change are indicative of the range of interests and topics in the Communication Studies Programme.

Students wishing to elect the Communication Studies Programme enroll at the University of Waterloo in the Faculty of their choice, and through the elective structure of their programme take communication courses. A list of courses and an outline of the programme requirements for the Communication Studies Programme can be found in the Course Description section of this calendar.

Inter-Faculty Programme Board
Members of the Board:
P.G. Cornell. E.D., M.A., Ph.D. (Toronto), Faculty of Arts
W.F. Forbes, D.I.C., Ph.D., D.Sc. (London), Faculty of Mathematics
G.R. Francis, B.A. (Toronto), B.A. (McGill), M.A. (British Columbia), Ph.D. (Michigan), Faculty of Environmental Studies
G.S. Kenyon, B.P.E. (British Columbia), M.S. (Indiana), Ph.D. (New York), Faculty of Human Kinetics and Leisure Studies
A.M. McLachlin, M.A. (Toronto), B.D., Th.D. (Emmanuel), St. Paul's College
D.E. Smucker, B.A. (Bluffton), M.A. (Chicago), B.D. (Princeton Theological Seminary), Ph.D. (Chicago), Conrad Grebel College
L.A.K. Watt, B.Sc. (Manitoba), M.S. (Chicago), Ph.D. (Minnesota), Faculty of Engineering

Associated Faculty
D.R. Gordon, B.A. (Queen's), M.A. (Toronto), Associate Professor

Inquiries concerning Inter-Faculty Studies should be addressed to the Office of the Vice-President, Academic.
**The Faculty of Mathematics**

Mathematics at the University of Waterloo was established as a separate faculty in 1967. General and Honours programmes in Mathematics had been offered through the Faculties of Arts and Science for a number of years and the continued growth and development of these programmes made it natural to unite them under one faculty. At the same time, this unification has led to greater flexibility in the choice of overall programmes.

The Faculty of Mathematics is a close association of the departments of Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics, and Statistics. Students may specialize in General and Honours programmes in various areas within these departments and may obtain the degree of Bachelor of Mathematics (B.Math) upon successful completion of a three-year Pass degree programme, a four-year General degree programme, or a four-year Honours degree programme.

The Faculty offers both regular and co-operative programmes in mathematics. The co-operative mathematics programmes, available for Honours and General students, involve re-arrangements in the scheduling of academic terms so as to permit considerable practical experience.

Applicants may also register for the regular programme (not the co-operative programme) through St. Jerome’s College. St. Jerome’s offers some of the courses leading to a B.Math degree in conjunction with the University.

The graduate school in the Faculty of Mathematics is very strong. Many graduate degrees are conferred each year and active research is carried on in many areas. For information concerning graduate programmes in mathematics, please consult the University of Waterloo Graduate Studies Calendar.

**Brochures**

The Faculty of Mathematics publishes a brochure which is specifically designed for Ontario secondary school students. Copies of this are available in school guidance offices. A supplemental version of this brochure is available for other applicants. Copies may be obtained by writing to the Assistant Registrar, Mathematics.

**The Applied Mathematics Department**

Traditionally, Applied Mathematics has been almost synonymous with Mathematical Physics but times change and today Applied Mathematics, while retaining its interest in the physical sciences, is broadening its scope and is becoming concerned with the applications of mathematics to the social and biological sciences. To handle the types of problems that arise in these areas the Applied Mathematician requires two things: a firm background in mathematics with a mastery of techniques and an ability to understand a problem when that problem is stated in the language of biology, economics, engineering, chemistry, physics or business.

With these considerations in mind the Honours Applied Mathematics programme at Waterloo has been developed as follows: in the first two years the student follows essentially the same programme as every other student in the Faculty of Mathematics and acquires a basic mathematical background; in year three a student is given some of the mathematical tools that will be indispensable - calculus of variations, tensor calculus and ordinary differential equations, and gets a firm grounding in mechanics and an introduction to partial differential equations. In fourth year the student is expected to choose some of the purely mathematical subjects such as partial differential equations, non-linear differential equations, Lebesgue integration and operator theory but equal emphasis is placed on the application of mathematics; for example, there is a one term course in continuum mechanics which is followed by either a course in elasticity or hydrodynamics or (we expect) aerodynamics; other courses are: statistical mechanics, quantum mechanics, general relativity theory, electromagnetic theory, control theory and differential geometry.

It is our belief that a graduate from this programme will be able to turn to many things ranging from meteorology, oceanography, seismic exploration and supersonic flow to the problems of navigation in space, control problems, ecological population studies and the study of epidemics.

The Applied Mathematics Department offers only an honours programme which is made up of courses chosen from M 234, 360, 361, 362, 363, 413, 441, 442, 443, 444, 445, 447, 448, 462, 463, 464.

For those students who wish a strong emphasis on Physics, the Department offers the programme “Honours Applied Mathematics with Physics Minor.”

**The Department of Combinatorics and Optimization**

**Combinatorics**

Combinatorics consists primarily of the study of finite sets, and their subsets, whose structure arises from practical questions of transportation theory, communications theory, linear programming, electrical networks and statistics. Combinatorial mathematics traces its roots to the study of puzzles and games of antiquity. But it is the contemporary environment, and in particular the development of the computer, which has provided the impetus to bring this field to maturity. It now plays a significant role in the analysis of questions of both pure and applied mathematics. One important area of Combinatorial Mathematics is Graph Theory, where a graph or network consists of vertices and edges that join pairs of vertices. Included in graph theory is one of the most famous of all unsolved...
problems in mathematics, the Four Colour Problem. A second area of Combinatorial Analysis is the study of counting or enumeration of sets of objects. As one wit has put it, it is Combinatorics that counts.

Optimization
The ultimate objective of nearly every Applied Mathematics study is to improve something; this is especially true in Business and Industry, and to a certain extent in Pure Science. A variety of mathematical methods has evolved which can be classified as optimization techniques. Every student of calculus finds the maximum of a function by setting its derivative equal to zero. The engineer uses more sophisticated methods of analysis to optimize hardware design. The well known travelling salesman problem in which a salesman desiring to visit a number of cities selects an itinerary to minimize travelling costs is an example of a combinatorial optimizing problem.

Optimization is particularly important in Business and Industry. For example, in an inventory or a scheduling problem the purpose of developing a mathematical model is to minimize cost or maximize efficiency or some other criterion. During the past decade several new general optimization techniques (e.g., linear programming, dynamic programming) have been developed specifically to handle such optimization problems.

The following undergraduate courses are offered by the Department of Combinatorics and Optimization: 239, 300, 307, 351, 352, 353, 417, 418, 446, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460.

The Computer Science Department
The computational power made available by the electronic computer has revolutionized the approach taken in many areas toward problem solving and research. In recent years a knowledge of Computer Science has become a valuable asset for work in many fields.

In addition to providing the student with a strong core of Mathematics, the Computer Science programme gives a solid foundation in programming languages, numerical methods, data structures, switching theory and machine architecture. Advanced students are offered courses in numerical analysis, scientific applications, operating systems, business systems analysis, simulation, automata theory, computability theory and formal languages.

The student is also encouraged to take a series of courses in some other discipline to which a knowledge of Computer Science can be applied.

Upon completion of the Computer Science programme, the student is qualified to enter a rewarding career in the computing profession and, in addition, is well prepared to undertake graduate study in Computer Science.

The Department of Pure Mathematics
Pure Mathematics has been termed the study of mathematics for its own sake, and many pure mathematicians would agree with this. Besides developing the fundamental areas of mathematics such as algebra, analysis and geometry, many pure mathematicians are interested in the philosophical foundations and historical development of the subject. A mastery of these fundamental subjects is also essential for a person who would prefer to apply mathematics, either to other basic sciences or to more practical matters. 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 much basic 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. However, the ability to think clearly and precisely, and to continue educating oneself (major parts of our objectives), are valuable in any field of endeavour.

The department has a special interest in the study of functional equations and their applications, i.e., the theory of determining functions from elementary equations containing them. It is a field of mathematics with a two century history, although the somewhat more general theory has developed only in the last two decades. Functional equations have applications in many classical and modern disciplines including probability and information theory, mathematical psychology, nomography, functional analysis, geometry and universal algebra. After attending these courses, the student will be well prepared for graduate studies in several fields of Mathematics and its applications to science, engineering and social sciences.

The following undergraduate courses are offered by the department. Note that some of the analysis courses are offered in conjunction with faculty in Applied Mathematics, and the geometry in conjunction with Combinatorics. In addition these departments offer courses in closely related subjects. Not all of the 400 level courses are offered every year.

<table>
<thead>
<tr>
<th>Course</th>
<th>Code(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductory</td>
<td>228</td>
</tr>
<tr>
<td>Algebra</td>
<td>341, 406, 407, 410, 411, 412, 428</td>
</tr>
<tr>
<td>Analysis</td>
<td>342, 343, 432, 433, 462</td>
</tr>
<tr>
<td>Functional Equations</td>
<td>480</td>
</tr>
<tr>
<td>Geometry</td>
<td>330, 407, 409, 428, 430, 448</td>
</tr>
<tr>
<td>Logic and</td>
<td>425</td>
</tr>
<tr>
<td>Foundations</td>
<td>408, 436</td>
</tr>
<tr>
<td>Number Theory</td>
<td>425</td>
</tr>
<tr>
<td>Topology Theory</td>
<td>344, 426</td>
</tr>
</tbody>
</table>
Department of Statistics

Statistics is the branch of modern applied mathematics which deals with the collection and analysis of data. Statistical methods are extensively used in Biology, Medicine, Health Sciences, Agriculture, Business, Economics, Engineering, and many other fields. Claims based on statistical arguments appear daily in the press, and it is difficult to assess these intelligently without some knowledge of statistical methods.

The statistician's first job is to determine what numbers to collect, and how to collect them so that they will be without biases and distortion. These problems are dealt with in the Design of Experiments and Sample Surveys. Statistical Inference is concerned with inferring what the population is like on the basis of a small amount of data (the sample). The link between population and sample is provided by Probability Theory, which forms an important part of the Statistics curriculum. Often the purpose for collecting data is to assist in reaching a decision, and Decision Theory is also a part of Statistics.

Many other areas of pure and applied mathematics find applications in Statistics. Calculus and linear algebra are used extensively in the undergraduate programme; abstract algebra, combinatorics, difference and differential equations, analysis, and measure theory are required in more advanced work. Most statistical analyses involve the computer, and a good background in Computer Science is highly desirable.

The Department also offers courses and programmes in Actuarial Science, which is the application of mathematics and statistics to Financial Problems, with particular emphasis on Life Insurance and 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.


Degrees

Mathematics Degrees

The Faculty of Mathematics offers several programmes leading to the following degrees: Bachelor of Mathematics (Pass), Bachelor of Mathematics (General) and Bachelor of Mathematics (Honours); details of these programmes appear in a later section. The basic distinction between these degrees lies in the number of mathematics courses required. The student who wants a modest amount of mathematics and an approximately even balance between mathematics and non-mathematics courses will usually choose the pass programme, the student who wants a wider coverage of mathematics but does not intend to be a specialist will normally elect the general programme while the person who wishes to concentrate on mathematics and possibly go on to graduate study will require an honours degree.

The table below lists the degree requirements in terms of credits; one credit is awarded for successful completion of an eight month (two terms) course and half credit is given for successful completion of a four month (one term) course.

<table>
<thead>
<tr>
<th>B.Math Degree Requirements</th>
<th>Pass</th>
<th>General</th>
<th>Honours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Total Credits</td>
<td>16</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>Minimum Math Credits</td>
<td>6</td>
<td>12</td>
<td>15†</td>
</tr>
<tr>
<td>Minimum Non-Math Credits</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Minimum Overall Average</td>
<td>50% †</td>
<td>50% †</td>
<td>60% †</td>
</tr>
<tr>
<td>Minimum Math Average</td>
<td>55% †</td>
<td>55% †</td>
<td>65% †</td>
</tr>
</tbody>
</table>

† 15 is replaced by 14 in the Chartered Accountancy and Business Administration Options, by 14½ in the Honours Applied Mathematics with Physics minor and by 12 in certain Joint Honours Programmes; for details see page 98.

The averages quoted are calculated from the marks of all courses taken, whether passed or failed.

Admission

General admission requirements and procedures are outlined in detail in Chapter 2. The following requirements relate specifically to programmes in the Faculty of Mathematics.

Applicants from Ontario Year 5

Applicants will normally include Relations and Functions, Calculus, and Algebra in their six Year 5 credits offered for admission. A minimum average of 60% is required for admission to the regular programme; a somewhat higher average is required for the cooperative programme.

Admission as an Adult Student

Any student who has been away from formal education for more than two years and who does not possess the minimum requirements for admission may apply as an adult student. The applicant should, however, have covered the material of the Ontario Year 5 mathematics courses, either through a local secondary school or
through the Correspondence Branch of the Ontario Ministry of Education and should provide evidence of being able to profit from a mathematics programme. Each application will be considered on its own merits by the Admissions Committee (See also Part-time Studies).

Advanced Standing

1) Transfer Credits

Students transferring into the Faculty of Mathematics either from outside or from within the University of Waterloo will normally be given transfer credit for a course previously taken if (i) a mark of at least 60% or equivalent has been obtained, (ii) a mark of at least 50% has been obtained in a non-mathematics University of Waterloo course or in a University of Waterloo mathematics course taken in a section specifically designated for mathematics students.

A mark of 50-59% in a mathematics course equivalent to a course required for a B.Math degree could give the student exemption from that requirement but not a credit towards the degree.

A maximum of six transfer credits per academic year previously taken will be given.

2) Cumulative Averages

Courses taken prior to a student's admission to the Faculty of Mathematics will not normally count in the student's subsequent cumulative averages. However, if the student was registered in a Joint Honours Mathematics programme in another University of Waterloo faculty subsequent cumulative averages would include all courses that would have been acceptable for credit for a student registered in the Faculty of Mathematics. All courses taken previously by students being re-admitted to the Faculty of Mathematics count in their subsequent cumulative averages if they had interrupted their studies after September 1969.

3) Co-operative Programmes

It is normally not possible to transfer into a co-operative programme beyond the second-year level. Students applying for transfer at the second-year level must have credit in courses equivalent to the first-year Calculus, Algebra, and Computer Science required of University of Waterloo mathematics students. Past experience has indicated that very few places in the co-operative programmes are available at the second-year level for students applying from other institutions. Applicants in this category who cannot be admitted to a co-operative programme will be considered automatically for the regular programme.

Part-Time Studies

Students wishing to work towards a degree in Mathematics on a part-time basis must meet the regular admission requirements.

Applicants who do not meet these requirements may be admitted as non-degree, part-time students at the discretion of the Admissions Committee. After completing the equivalent of two full Mathematics courses, they may apply for degree candidacy. If regular admission is granted, any credits earned as a non-degree, part-time student will count towards B.Math degree requirements.

The B.Math Pass degree may be obtained entirely by part-time studies. The B.Math General degree requires at least two terms on campus; the B.Math Honours degree requires at least four terms on campus.

Mathematics courses are not normally offered in the evenings or on Saturdays, although a reasonable cross-section of elective courses is available in the evenings during the Fall/Winter sessions. Many part-time students take courses via the University of Waterloo Correspondence Programme. (See page 16 for more details of this programme; a separate brochure is available.)

Fees, Financial Assistance

See Chapters 3 and 4.

Standings and Promotions

An academic year comprises two academic terms. Full course refers to a course lasting two terms. Two half courses (term courses), not necessarily in the same subject, constitute the equivalent of a full course.

A mark of at least 50 in a full course/term course is a credit/half credit; a mark of under 50 is a failure. A course attempt refers to a course registration not formally cancelled with the Registrar by the dates specified for dropping courses.

In addition to marks from the numerical scale 0-100, the designations INC, AEG, CR, NMR, and DNW may be used from time to time. These designations are defined on page 16. Courses recorded as AEG or CR will count as credits but will not affect cumulative averages: those recorded as NMR, DNW, or INC will count as zero in cumulative averages.

A student who has passed fewer than five courses, at least five courses but fewer than ten, at least ten but fewer than sixteen, sixteen or more, is considered a first, second, third, or fourth year student respectively.

The Faculty operates under a course credit system and the following regulations govern the practice of the Faculty with regard to standings and promotions.

1) Examining Body

The Faculty constitutes the examining body for all examinations. All examination results are considered by the Faculty Committee on Standings and Promotions and subsequently by the Faculty Council and are then issued to the individual students by the Registrar.
2) Part-time/Full-time Terms
A part-time student is one registered for either one or two course attempts per term. In each term except the graduating term, a full-time student must register for at least five course attempts and each full-time term must include at least two mathematics courses. The Pass B.Math. degree can be completed entirely by part-time study. The General B.Math. degree requires two full-time terms of study; the Honours B.Math. degree requires four full-time terms.

3) Academic Decisions
Progress from one academic year to another depends on both an overall cumulative average (O.C.A.) and a mathematics cumulative average (M.C.A.) as well as on courses passed and failed. At the end of each academic year a student will be given one of the following decisions.

a) May proceed clear.
In a Pass or General programme the O.C.A. \geq 50\% and the M.C.A. \geq 55\%. In the Honours programme, the O.C.A. \geq 60\% and the M.C.A. \geq 65\%.

b) May proceed clear – must improve averages to remain in the Honours programme.
The student’s averages satisfy the requirements for the Pass or General programme but not the Honours programme.

c) May proceed in the regular programme only.
The student in the Co-operative programme had at least one average < 55\% or had an unsatisfactory work term report.

d) May proceed on probation – must improve cumulative averages.
Both averages are at least 45\% but either
(i) 45\% \leq \text{O.C.A.} < 50\% or
(ii) 45\% \leq \text{M.C.A.} < 55\%.
The student will not normally be allowed to continue in the Honours programme.

e) Withdrawal required from Mathematics – may reapply in one year.
The first year student's averages are both at least 40\% but one is less than 45\%.

f) Withdrawal required from the Faculty of Mathematics
A student who falls in one of the following categories will normally be required to withdraw from the Faculty of Mathematics.

i) A first year student whose averages are not both > 40\% or an upper year student whose averages are not both > 45\%.

ii) A student who is already “on probation” and who fails to achieve an academic decision of “may proceed clear” in the student’s next academic year.

iii) A student who fails to complete the requirements for a Pass degree at the end of four academic years, or equivalent.

iv) A student who is judged to be unlikely to profit from further study in the Faculty of Mathematics.

Note
A student who has been required to withdraw from the Faculty of Mathematics may reapply for admission after a three year period but must produce evidence of being able to profit from further study in the Faculty.

4) Failed Courses
a) All papers that receive a failing mark are automatically re-read. Any student wishing to appeal a mark must do so by contacting the Assistant Registrar, Mathematics, within one month of the official announcement of term or year marks. There is a charge of $5.00 per course appealed, to be refunded if the mark is raised.

b) Failed non-compulsory courses need not be repeated but may be replaced by other non-compulsory courses.

5) Repeated Courses
A passed course may be repeated for the purpose of raising cumulative averages. Both marks will show on the record and both will be counted in the averages. However, a course will not be counted more than once towards the total number of courses required for a degree.

6) External Courses
Permission to take courses from other universities for credit towards a B.Math. degree must be obtained in writing from the Standings and Promotions Committee through the Assistant Registrar, Mathematics. Permission will normally be given only for non-mathematics courses.

7) Illness or Incapacity
Students missing academic work or examinations for medical or other special reasons should so inform their instructors and provide official documentation to the Assistant Registrar, Mathematics, at the earliest possible opportunity.

8) Cancelling Course Registrations
No course registration can be dropped later than one month prior to the end of lectures in the term/year of the course unless the student voluntarily withdraws from the Faculty.

9) Voluntary Withdrawal
A student may withdraw from the Faculty of Mathematics up to and including the last day of lectures of
the term/year without being held responsible for that term's/year's courses.

10) Qualification for Graduation
After completing no more than five academic years, or equivalent, a student must apply for the award of a degree by filling out an "Intent to Graduate" form. If, at the end of five academic years, or equivalent, the requirements for more than one degree have been fulfilled, the student will be awarded the highest degree (Pass, General, or Honours B.Math.).

Academic Programmes

General Remarks
In addition to the Pass, General and Honours programmes in which regular students enrol there are special co-operative programmes (Teaching Option, Chartered Accountancy and Business Administration Options) which are available in both General and Honours versions; for details see page 90. Furthermore, double and joint honours programmes within the Faculty and joint honours programmes with other Faculties are possible; for details see page 86.

A first year student will be registered in one of the above-mentioned programmes but is not thereby irrevocably committed; in subsequent years it is quite possible to move from one programme to another provided that the prerequisites of the new programme are met.

The first year programme is such that the student can transfer to other Faculties in the second year if electives have been chosen judiciously.

In the first two years students are not associated with any department but at the beginning of the third year Honours students must select the department in which they intend to do their major work; pass and general students may associate themselves with a department - a procedure that allows them to turn to the departmental undergraduate officer for advice but does not subject them to departmental regulations.

The five departments that constitute the Faculty are Applied Mathematics, Combinatorics and Optimization, Computer Science, Pure Mathematics and Statistics. The departments offer only Honours programmes.

All programmes have certain compulsory courses (core courses) that are available in both general and honours versions; credit in an honours course may be used to satisfy a requirement in the corresponding general or pass course but credits in a pass or general course may not be used to satisfy an honours course requirement. Occasionally, a student who has done well in the pass or general version of a course (e.g. M217) wishes to get credit in the corresponding honours course (M237); the procedure then is that the student asks the Standings and Promotions Committee for permission to write the honours examination; if permission is granted both marks will be used in computing the student's cumulative average. Students receiving grades of 80% or higher in all four half courses M119a/b, 120a/b will be notified that they may go into the second year of an Honours programme provided that their work in other courses is satisfactory.

Students coming in from Year 5 (Grade 13) with a mathematics average less than 75% are strongly advised to take M119a/b, 120a/b.

Courses designated MTHEL may be taken as non-mathematics electives; they will not count as mathematics credits.

Some courses offered by other Faculties have considerable mathematical content and it is not possible for a student to obtain credit in such a course and also in the corresponding mathematics course; a list of such courses is available at pre-registration and may also be obtained from the undergraduate advisors.

Three Year Pass Programme
Required courses: M119a/b; 120a/b; two of 112a/b, 122a, 132a/b, 240b.

Typical Programme:

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits</td>
<td>Credits</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

The Pass programme must be completed within four academic years.

Four Year General Programme
Required courses: M119a/b; 120a/b; two of 122a, 132a/b, 240b; 217; 219; 319; one of 312a, 334a/b; 312b.
† These requirements do not apply to the Chartered Accountancy and Business Administration Options: for details see p. 90.

Typical Programme:

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits</td>
<td>Credits</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Students interested in the following areas are encouraged to take any or all of the courses listed:

Actuarial Science M223; 235; 335; 336; 437; 461a.

Computer Science M122a; 132a/b; 240b; 314a/b; 320a/b; 340a/b; 371a; 372b; 471a; 474a/b/c/d.

Combinatorics M223; 239; two of 351a/b, 352a/b, 353a, 452a/b, 454a/b, 455a, 456a.
Pure Mathematics: M228; 330; 344; 351a; 351c; 425; 436; 446.

Statistics: M223; 339a/b; 349a; 449a/b; 467a.

The General Programme must be completed within five academic years.

Four Year Honours Programme

Required (core)+t courses:
M129; 130; two of 122a, 132a/b, 240b; 229; 233; 237; 329; one of 332a, 334a/b; 332b.

* These requirements do not apply to the Chartered Accountancy and Business Administration options: for details see p. 90.

† In the Pure Mathematics programme 341 replaces 329 and 342, 343 replace 332.

Applied Mathematics

Core requirements and at least four credits from departmental third and fourth year courses; at least one credit must be at the 400 level. M234a/b are recommended courses.

Recommended courses for Honours Applied Mathematics with Physics Option:
Physics 121*/122* or 162*/163*; 252*/253*, 255*, 355*, 358*/359*, 435, 441 and Chemistry 121*/122*.

Combinatorics and Optimization

Mathematics courses taken must include at least one full (two half) departmental three-hundred level courses and two full (four half) departmental four-hundred level courses. Mathematics 239a/b are recommended. Students must take a total of eight full (sixteen half) credits in third and fourth year mathematics including at least three third year and three fourth year credits.

Computer Science

Core requirements and mathematics courses which should include: M122a, 132a/b, and 240b; at least four full (eight half) courses in Computer Science at the three-hundred or four-hundred level; at least three full (six half) mathematics courses from other Departments in the Faculty at the three-hundred or four-hundred level; at least three full (six half) courses at the four-hundred level; the Faculty requirements, 329 and 332b and at least one of 332a, 334a/b.

Computer Science courses offered by the department fall in three areas:
Numerical Analysis: M334a/b; 470a/b.
Software: M340a/b; 471a; 474a/b/c/d.
Theory of Computation: M371a, 372b, 472a/b/c. At least three half courses must be selected from one area and at least three half courses must be selected from the other two areas combined.

Mathematics

Core requirements and M341; 342; 343; 344a; two 400 level courses in Pure Mathematics. Not all of 341, 342, 343, 344a need be taken in third year.

Statistics

Core requirements and M338; 339; 438; 439a; 467a.

Actuarial Science

Core requirements and M223; 336; 437; two half courses from 335a/b; 435a/b, 461a/b.

Double Honours Programmes Within the Faculty of Mathematics

A student who has satisfied the requirements for any two of the above six honours programmes may elect to have both areas named on his degree.

Joint Honours Programmes Within the Faculty of Mathematics

In the following programmes, students must satisfy all requirements of the honours programme in the first-named subject.

Actuarial Science and Computer Science

Computer Science requirements are M122a, 132a/b, 240b, 314a/b, 320a/b. In exceptional circumstances, these courses may be replaced by other upper-level half courses in Computer Science.

Computer Science and Statistics

Statistics requirements are at least four half-courses in Probability and Statistics at the third or fourth year levels, including M338b or 349a; 467a; 439a or 449a.

Statistics and Computer Science

Computer Science requirements are M122a, 132b, 240b, 474a; 314a/b or 334a/b; an additional half course in Computer Science at the third or fourth year level.

Joint Honours Programmes With Other Faculties

Joint Honours with Mathematics Major
Mathematics and Economics
Mathematics and French
Mathematics and Geography
Mathematics and Philosophy
Mathematics and Psychology
Mathematics 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 faculty and departmental requirements for an honours programme must be satisfied. However, the number of required credits in Mathematics is reduced from 15 to 12. These programmes must be approved by
both departments involved. Requirements in the minor subject are as follows:

Economics 101*/102*, 201*/202*, 231*, 311*, 312*; seven additional one-term courses in Economics.

French 190 Group B; seven additional full courses in French with three at the second year level, two at the third year level, and two at the fourth year level.


Philosophy 280/1, 282/3; 340, 358/9; three additional full courses in Philosophy, one of which is in a value area.

Psychology 101/2, 499; five additional full courses in Psychology chosen in consultation with the Psychology Department to fulfill their requirements.


Joint Honours Programmes With Other Faculties

Joint Honours with a Minor in Mathematics

Economics and Mathematics
French and Mathematics
Geography and Mathematics
Man-Environment Studies and Mathematics
Philosophy and Mathematics
Psychology and Mathematics
Sociology and Mathematics

Requirements for a minor in Mathematics are:

Mathematics 129, 130, 229, 237
At least three additional credits (six one-term courses) in Mathematics at the 100 level or above.

Students wishing to specialize in one area of mathematics should consult the undergraduate officer of the appropriate department in the Faculty of Mathematics for advice in selecting their mathematics courses.

Co-operative Mathematics Programmes

For general information on the Co-operative Programmes, please read Chapter 2 of this calendar.

The academic requirements in the co-operative programmes in actuarial science, computer science, optimization, and statistics, are identical with those outlined under the corresponding regular programme. In this section we outline the requirements for certain special options.

Business Administration Option

<table>
<thead>
<tr>
<th>Honours Programme</th>
<th>General Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td><strong>Year 1</strong></td>
</tr>
<tr>
<td>M122a, 129, 130,</td>
<td>M119a/b, 120a/b,</td>
</tr>
<tr>
<td>132a, Economics</td>
<td>132a, 132a</td>
</tr>
<tr>
<td>101/102, 191/192</td>
<td>Economics 101/102,</td>
</tr>
<tr>
<td>Business 111/121</td>
<td>191/192</td>
</tr>
<tr>
<td></td>
<td>Business 111/121</td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td><strong>Year 2</strong></td>
</tr>
<tr>
<td>M229, 233, 237</td>
<td>M217, 219, 223a/b</td>
</tr>
<tr>
<td>Two of M132b,</td>
<td>Two of M132b,</td>
</tr>
<tr>
<td>235a, 239b</td>
<td>235a, 239b</td>
</tr>
<tr>
<td>Business 212/222</td>
<td>Business 212/222</td>
</tr>
<tr>
<td>One elective credit</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td><strong>Year 3</strong></td>
</tr>
<tr>
<td>M320a/b, 349a/b,</td>
<td>Three math</td>
</tr>
<tr>
<td>352a/b†</td>
<td>credits†</td>
</tr>
<tr>
<td>One additional</td>
<td>Business 388/398</td>
</tr>
<tr>
<td>math credit†</td>
<td>One elective credit</td>
</tr>
<tr>
<td>Business 391/392</td>
<td></td>
</tr>
<tr>
<td>One elective credit</td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Year 4</strong></td>
<td><strong>Year 4</strong></td>
</tr>
<tr>
<td>Three math</td>
<td>Two math</td>
</tr>
<tr>
<td>credits†</td>
<td>credits†</td>
</tr>
<tr>
<td>Business 481/491</td>
<td>Business 481/491</td>
</tr>
<tr>
<td>Two elective</td>
<td>Two elective</td>
</tr>
<tr>
<td>credits†</td>
<td>credits†</td>
</tr>
</tbody>
</table>

† See Notes 1, 2, 3 under Chartered Accountancy Option

Chartered Accountancy Option

It is possible for students enrolled in the Co-operative Mathematics programme to choose their non-mathematics elective courses in such a manner that they may be able to write their final Chartered Accountancy examination within a few months of graduation. This programme is offered in co-operation with the Institute of Chartered Accountants of Ontario. This option involves a single stream co-operative programme; students go on their first work term in January.

<table>
<thead>
<tr>
<th>Honours Programme</th>
<th>General Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td><strong>Year 1</strong></td>
</tr>
<tr>
<td>Option</td>
<td>Option</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td><strong>Year 2</strong></td>
</tr>
<tr>
<td>M229, 233, 237</td>
<td>M217, 219, 223a/b</td>
</tr>
<tr>
<td>Two of M132b,</td>
<td>Two of M132b,</td>
</tr>
<tr>
<td>235a, 239b</td>
<td>235a, 239b</td>
</tr>
<tr>
<td>Business 477/216</td>
<td>Business 477/216</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td><strong>Year 3</strong></td>
</tr>
<tr>
<td>M320a/b, 349a,</td>
<td>Three other math</td>
</tr>
<tr>
<td>352a/b†</td>
<td>credits (M132b, 235a,</td>
</tr>
<tr>
<td>1½ additional</td>
<td>239b, 349a, 352a/b</td>
</tr>
<tr>
<td>math credits†</td>
<td>recommended)</td>
</tr>
<tr>
<td>Economics 391/392</td>
<td>Economics 391/392</td>
</tr>
<tr>
<td>One elective credit</td>
<td>One elective credit</td>
</tr>
</tbody>
</table>
Year 4

Three math credits††  Three math credits††
Economics 393/394  Economics 393/394
Business 487/363  Business 487/363
One elective credit

Notes
1) † These three credits constitute the core requirements for this option. One of these may be delayed to Year 4 and certain substitutions can be made with special permission.
2) †† Recommended courses are:
   Optimization M451a/b, 452a/b, 453a/b, 455a/b, 456a.
   Computer Science M240b, 314a/b, 340a/b, 474c/d.
   Statistics M339a/b, 349b, 449a, 466a, 467a.
   Actuarial Science M335a/b, 336a/b, 437a/b, 461a/b.
3) At least seven 300 and 400 level full courses (or equivalent) must be included in the Honours programme, with at least two of them at the 400 level; of these seven courses, at least one full course must be chosen from each of the areas: Optimization, Computer Science, Statistics.

Teaching Option
The Co-operative Mathematics Teaching Option is a uniquely integrated programme involving the Faculty of Mathematics and Althouse College of Education of the University of Western Ontario. This programme combines academic work, experience in secondary schools, and professional training, with the graduate fully qualified as a secondary school mathematics teacher.

Students interested in the programme will enrol in the Regular programme in Year 1, and are admitted to the Co-operative programme in Year 2 on the basis of good academic work and success in an interview process.

Students enrolled in the Co-operative Mathematics Teaching Option must, in addition to required Faculty courses, include the following:
M300a/b, 446a/b, Mthel 206a,
Psych 241*, 242*, Phil 311*, 312*, Soc 207G*,
and one further full course or equivalent in Computer Science.

Honours candidates must include at least three 400 level full courses (or equivalent) in their programme. 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 Althouse College components are outlined in a separate brochure available upon request.
Faculty of Science
Glass blowing experiment
The Faculty of Science

The first students were enrolled in the Faculty of Science in the autumn of 1959. Enrollments have increased significantly thereafter until by the autumn of 1974 over 1900 full-time students, of which more than 200 are graduate students, are taking programmes within the Faculty. In addition, courses are provided for students in arts, environmental studies, engineering, mathematics and kinesiology and recreation.

There are five teaching departments in the Faculty of Science: Biology, Chemistry, Earth Sciences, Physics and the School of Optometry. Extensive instruction is also given by members of the University's Faculties of Arts and Mathematics. Astronomy and Biophysics are taught in the Physics Department; Biochemistry is offered in the Chemistry Department; Botany, Microbiology and Zoology and certain courses embracing these fields together (e.g. Genetics, Cell Biology and Ecology) are taught in the Department of Biology. All the departments as well as the School of Optometry offer post-graduate programmes and research facilities and these are published in a separate Graduate Calendar. The new M.Sc. programme in Earth Sciences offers specialization in the area of Environmental Geology while the new Optometry graduate programme offers M.Sc. studies in Physiological Optics. The majority of the graduates in Honours programmes in Science undertake some post-graduate study.

The School of Optometry in the Faculty of Science developed from the former College of Optometry in Toronto. This has been integrated into the Faculty of Science and offers a 5-year programme leading to the degree of Doctor of Optometry (O.D.). This new Programme commenced in September of 1967. Further information appears on page 207.

Most Science students are enrolled on a full-time basis. Each year of any programme in this Faculty except Co-operative Applied Physics, Co-operative Applied Chemistry and Co-operative Honours Earth Sciences is offered in two terms throughout a conventional academic year. The Applied Physics and Applied Chemistry programmes are given exclusively on a co-operative basis with alternating terms of academic and industrial work; refer to Chapter 6 for further information on the Co-operative programmes.

The Dean and Department Chairmen will be pleased to receive inquiries about the programmes in this Faculty. Students contemplating post-graduate study should direct their correspondence to the chairman of the department in which they propose to specialize.

Degrees

The degree of Bachelor of Science (B.Sc.) is awarded by the University on the successful completion of any of the undergraduate programmes involving Biology, Chemistry, Earth Sciences and Physics which are listed below. The ordinary or pass-level B.Sc. will be awarded on completion of the General Science Programme in either the three or four-year option. The honours degree, B.Sc. (Honours), will be awarded on completion of any of the honours programmes shown under Academic Programmes. The O.D. (Doctor of Optometry) degree is described above. M.Sc. and Ph.D. degrees are discussed in the Graduate Calendar.

Admission

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

Applicants from Ontario Year 5

Applicants must present the following Mathematics courses – Relations and Functions, and Calculus (or the old 2-credit Math A), and two Science courses, one of which must be Physics or Chemistry. Both Physics and Chemistry are strongly recommended.

Year 1 Programmes

The following specifically labelled Year 1 programmes are offered: Co-operative Applied Chemistry, Co-operative Applied Physics and Regular Science. The Year 1 Regular Science Programme is a common first year for all students whether General or Honours and for all non-major or majoring programmes; there are a wide variety of elective courses available with certain courses required if a particular majoring area is desired in Year 2. Year 1 Regular Science also provides the background of the pre-professional year necessary to apply for admission to Year 2 Optometry (the first year of the professional programme). Students planning to enter the Co-operative Earth Sciences programme in Year 2 should also take Year 1 Regular Science.

Admission as an Adult Student

It is recommended that applicants obtain standing in Ontario Year 5 (Grade 13) Mathematics and Science courses or their equivalent in order to have the proper background for first year University courses in these areas. To discuss admissibility and appropriate qualifying work, applicants are advised to contact the Assistant Registrar, Faculty of Science.

Advanced Standing

Students applying to Co-operative programmes in the Faculty of Science will not be admitted above the Year 3 Term A level. Any student thus admitted would be required to complete a minimum of
three work terms.

Students within the University desiring to transfer into the Faculty of Science will be given a choice of two methods as follows:

1) Admission credit for courses passed with a grade C or better without a cumulative average or
2) Admission credit for all relevant courses (including D's) passed, but with a cumulative average based on all courses attempted, whether passed or failed.

Students transferring from other universities are judged on their merits and will be allowed transfer credits on a basis similar to those allowed Waterloo students.

Registration
Registration and preregistration (course selection) dates are published in the front of this calendar.

To facilitate timetabling, all students are asked to select their programmes and courses in advance of their arrival on campus. Upper year students will do this as listed in the schedule (the normal preregistration period for most Science students is in mid-March). Further information will be announced prior to the preregistration period. Newly-admitted students will be mailed information on course selection shortly after confirming their intention to enrol in the Faculty of Science (for most freshmen this will be in the latter part of June). This information is designed so that students can select their courses by mail; any student wishing to discuss course selection may arrange an on-campus personal interview as outlined in the information package.

Examinations and Standings
The following regulations govern the practice of the Faculty of Science in regard to final examinations, standing and make-up examinations. These regulations also apply to part-time students and special programmes.

Students should note that the Faculty of Science now operates under a "course system" in which student progress is measured by courses successfully completed rather than by years. Students who have passed fewer than five courses will be considered Year 1 students; those who have passed at least five courses but fewer than ten will be considered Year 2 students; those with at least ten but fewer than fifteen, Year 3; and those with fifteen or more, Year 4; Year 5 students will exist only in the Optometry programme for those students in their graduating year.

1) Final Examinations
a) The faculty constitutes the examining body for all examinations. All examination results are considered by the Examinations and 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) For Students in Regular Programmes:
Final examinations in one-term courses are held in December or in April. Final examination for all full year courses are held in April, and cover the whole work of each course. Make-up examinations are held in July. The time normally allowed for each examination is three hours.

c) For Students in Co-operative Programmes:
In Year 1, final examinations in one-term courses are held at the end of the term in which the course is taken, whereas final examinations in full-year courses are held at the end of the second term and cover the whole work of each such course. Beyond first year, final examinations are usually held at the end of each term. The time normally allowed for each examination is three hours.

d) In all courses each student is required to submit, in such form and at such time as may be determined by the instructor, evidence of satisfactory participation in term work. The marks obtained for work during term are used, in part, in determining standing. The ratio in which marks for term work and written examinations are combined is at the discretion of the individual departments. To pass in a course, a student must obtain a minimum of 50% in the combined term and examination marks. At the discretion of the chairman of the department concerned and of the Dean, a student may be barred from the final examination if the course requirements are not completed to the satisfaction of his instructor. Some courses and/or instructors may not require final examinations; in such cases term work only will be used in determining a final grade.

e) 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 medical or health-related 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.
f) All examinations which receive a failing grade are automatically re-read.

2) Standing

a) 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.

In addition to numeric marks, the following designations may be used from time to time:

INC (either term work, lab work, examinations, 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 applicable).

NCR (credit is not granted where performance was unsatisfactory but no specific mark is given).

AUD (a course which is audited only and is neither averaged nor counted for credit).

NMR (no mark reported).

DNW (final examination not written in a course that has not been dropped officially).

AEG or CR will count as a course passed towards the total necessary but will not count in the overall average. INC, NMR or DNW will indicate a situation that has to be resolved to the satisfaction of the Examinations and Standings Committee.

Unless there are medical or other extenuating circumstances, a DNW will usually be weighted for averaging purposes as the lowest possible failing mark (32, equivalent to F— on the common grading system) in determining standing.

b) Overall standing will be determined at the end of each year by the cumulative average of all courses taken at the University (at any time, whether passed or failed).

To proceed in the General programme requires a cumulative average of 50% overall; if a field of specialization is chosen after Year 1, a 60% cumulative average in this field will also be required. To proceed in an Honours programme requires a cumulative average of 60% overall and 60% in the courses of the major subject(s). The Optometry programme is evaluated in the same manner as the regular Honours programmes of the Faculty.

Since Year 1 Science is essentially a common year a student may enter any Year 2 programme in good standing if the appropriate courses were selected and if the Year 1 programme is completed with the required overall average; the only exception to this is in the Optometry programme where enrolment limitation may be necessary in Year 2 (see page 209 for further details). Normally a 60% or better standing in a major field subject is required to enrol in a majoring programme; this requirement may be waived in consideration of an otherwise good overall record or for other acceptable reason at the discretion of the Undergraduate Officer or the Chairman of the majoring Department concerned.

If an upper year student fails to meet either of the above required cumulative averages he will be designated as in Conditional Standing for the following year. A General student in Conditional Standing must improve his/her standing to at least the minimum overall level noted or else will be required to withdraw from the Faculty; students in the 4-year majoring programme may be transferred to the 3-year programme where no major field average is required.

An Honours student in Conditional Standing may elect to transfer to the General programme in good standing (if this is possible) or may endeavour to improve his/her Honours average to the cumulative minimum required; if such improvement is not forthcoming such a student will be transferred to the General programme. Alternatively, the Examinations and Standing Committee may decide that such a student must transfer to the General programme (either option). An Honours student in Conditional Standing may be required by such a student's major Department to repeat certain courses which have been done poorly or the individual may elect to do so himself in order to improve performance in subsequent years.

A student's standing (overall) will be interpreted each year according to the following terms:

<table>
<thead>
<tr>
<th>Cumulative Honours Programme</th>
<th>General Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>Programme</td>
</tr>
<tr>
<td>80.00-100</td>
<td>Excellent</td>
</tr>
<tr>
<td>70.0-79.9</td>
<td>Second Class Honours Very Good</td>
</tr>
<tr>
<td>60.0-69.9</td>
<td>Third Class Honours Good</td>
</tr>
<tr>
<td>50.0-59.9</td>
<td>Passing</td>
</tr>
</tbody>
</table>

Below these levels will be Conditional Standing or Failure, required to withdraw, depending upon circumstances. Normally, Conditional standing will be allowed the first time unless the student’s performance has been very poor; for such a poor first-time per-
formance, or any time such a level is achieved twice, Failure, required to withdraw will be necessary.
If a regular (full-time) student, even in good standing, fails more than two full-year courses or their equivalent in a given year such student may be transferred to the General programme or else may be asked to withdraw if the Department feels unsatisfactory progress is being made towards a degree. Students thus asked to withdraw may be eligible to apply for re-admission only after a one-year’s absence. Students asked to withdraw after the equivalent of two “years” in Conditional or “Failed” standing (here or elsewhere) will normally not be re-admitted.

Note
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.

c) Programme selection:
Full-time students. All first year students must take a minimum of 5 courses and no more than 6 courses will be permitted except in exceptional cases. In subsequent years, a General student will normally take 5 courses minimum, 6 courses maximum per year, unless fewer are needed for graduation. Honours students in upper years will follow Department recommendations (usually 6-7 courses per year). An extra course once completed will normally count as a course passed or failed as well as in calculation of the cumulative average (the only exception to this would be for graduating students taking more than the minimum number of courses needed for graduation). All students taking extra courses should have a cumulative average of 70% or better (or in the case of Year 1 students, a Year 5 average of 70% or better).
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 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. The Science Faculty does allow the General degree in either option, to be pursued on a part-time or reduced programme basis subject to approval by the Associate Dean (Undergraduate Affairs) and the Department concerned (where the programme involves a major field). Normally, no first year programme for a full-time student may be reduced below the 5 course minimum except in exceptional circumstances.

d) Co-operative Programmes: Students in Co-operative programmes will be evaluated by the rules shown modified where necessary to suit their special needs. In particular:

1 Evaluation in Year 1 will be made at the end of term 1B on the entire year’s work. Students must have a 60% average to proceed to term 2A. Those below this average may be transferred to the General programme (non-Co-op) in good standing if possible or may be allowed to repeat the 1B term in Conditional Standing in order to remain in the Co-op programme. Students who have done very poorly and who are felt unable to repeat the 1B term will be transferred to the Year 1 regular programme in Conditional Standing, or else may be asked to withdraw from the Faculty.

2 Upper year assessments will be made on a term by term basis and cumulative average, make-up examination privileges, conditional or good standing, etc., decided then. Beyond Year 1, the various programmes are mostly composed of one-term courses in which all marks are final. Depending on electives chosen there may be some mixture of term and full-year courses. Assessments made in terms 2A and 3A will be on the basis of marks in all courses taken; no make-up examinations will be given in the first half of a full-year course; 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. Make-up examinations may be allowed in one-term courses at any time and in full-year courses at the end of the second term only. 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 his Department to do so.

Make-up Examinations
The Faculty of Science will no longer grant automatic supplemental examinations to all students in good standing. This is in line with general practice in other faculties and universities operating on a credit system. It has been the experience in the Faculty of Science at Waterloo that the majority of students who have failed courses have subsequently failed to pass supplemental examinations. The Science Faculty realizes that course prerequisites are important to students proceeding to a Science degree and will endeavour to grant make-up
examination privileges to deserving students in good standing but only in a limited number of cases according to the following general principles:

A) In any case where failure to pass is attributable to extraordinary circumstances, especially medical or health-related problems.

B) In any year, normally only where such failed courses could not be repeated and where a student's progress could be unduly held up by lack of one prerequisite. Non-prerequisite courses would have to be repeated, i.e. most Arts courses and non-required Mathematics or Science courses, and many others could be repeated on a co-requisite basis.

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 has failed more than two full courses or their equivalent in a given year (except on medical grounds as in A).

Make-up examinations will be held in July for regular programmes. Applications for these examinations must be filed by the end of June on forms provided by the Office of the Registrar. In co-operative programmes, make-up examinations will be written in the term immediately following that in which the respective final examinations are written. Fees for make-up examinations must accompany the application. If the student decides not to write the examination, the fee is not refunded.

Except in extraordinary circumstances, (e.g. A above), when a make-up examination is passed, the course will count as a course passed toward the degree, but the mark obtained will not be counted in determining cumulative averages (i.e. the original mark will normally be the mark which counts).

Other General Comments

a) Transfer Students
Students will be accepted for transfer from other Year 1 programmes in the University or from other universities. Their programmes will be evaluated in terms of the number of course credits allowed and the number remaining for a degree. Students from other universities will not have previous background used in calculating Cumulative Averages. Students from other faculties at Waterloo may have cumulative averages which include courses transferred for credit (See Admission Requirements).

b) Transferability or Upgrading of B.Sc. Degree
A student who has graduated with a 3-year General degree 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 from this University or from another university may not upgrade a General B.Sc. or its equivalent to a Waterloo Honours B.Sc. However, from time to time such conversion privileges may be allowed in exceptional cases on the recommendation of the Department(s) concerned and with the approval of the Examinations and Standings Committee.

c) Future Requirements
The Faculty of Science changed to a course-credit system in 1969. As the faculty gains experience in the operation of such a system, these rules may be modified from time to time. Every effort will be made to operate consistent practices within each programme and broadly across the faculty and the University where desirable. Normally, students will be given advance warning of changes in regulations but the faculty reserves the right to make changes without notice where necessary.

Course and Programme Changes

a) Students may add and drop half courses during the first three weeks of the Fall, Winter and Spring terms upon having the appropriate change form completed.

b) Students may add and drop full-year courses during the first three weeks of the Fall term upon having the appropriate change form completed.

c) After these periods, students will be allowed to add courses only with the permission of the instructor and the appropriate undergraduate officer and upon completing the appropriate change form.

d) After these periods and until the last day of lectures, students may reduce their programmes from honours to general where appropriate.

e) Extra courses may be dropped after the normal three week change period but normally not after November 15 or July 1 for Fall and Spring one-term courses or March 1 for Winter one-term or full-year courses. An extra course is defined as one course beyond the minimum or five required in Year 1 or any year of the General Programme or one beyond the published minimum required for an Honours Programme (usually
6-7 courses depending on major field of study). Under the course-credit system, extra courses, once completed, are included in the cumulative average. All students other than those in Year 1 should clearly indicate to the appropriate Faculty advisor at Registration time which courses are to be regarded as extra.

Academic Programmes

Students entering first year in the Faculty of Science are essentially enrolled in a common year. Year 1 Co-operative Applied Chemistry and Co-operative Applied Physics are labelled as such but all other students are officially in Year 1 Regular Science. Year 1 Regular Science students are not designated as Honours or General or according to any specific programme. (Students planning to enter Co-operative Earth Sciences in Year 2 should enrol in Year 1 Regular Science.) Essentially the same courses are available to all first year students and any student may enter any Year 2 programme in Science provided he or she has taken the necessary courses in Year 1 and has achieved the necessary passing average; the only exception to this is in the Optometry programme where enrolment limitation may be necessary in Year 2.

In descriptions of programmes to follow, the term "course" refers to a course which extends for one full academic year; two half-year (or one-term) courses are the equivalent of one full course (one-term courses are marked with * following the course number). The symbol * after the number of laboratory hours indicates a laboratory taken in alternate weeks.

First Year Programmes (Regular and Co-operative)

The normal minimum course load for a full-time student in Year 1 Science is 5.0 lecture courses, exclusive of laboratory credits. At least two of these courses must be Faculty of Science courses and one of which should be an Arts elective (preferably English or Psychology). Only students whose secondary school Year 5 average was 70% or better may select 6 courses if they wish (recommended for students intending to take an Honours Physics programme). No more than 6 courses will be allowed except in exceptional cases.

Courses should be chosen with a Year 2 goal in mind or else should be made general enough to cover many Year 2 programmes. The recommended Year 1 selections for various Year 2 Honours or General Science-Majors programmes are shown below; in most cases the number of required courses has been held to only two with up to two more recommended (but not compulsory). To enter a Year 2 programme a student must achieve the Year 1 average necessary and must have taken the required courses. Students who elect 6 courses instead of 5 will have one less elective to take in one of the upper years, or else may enrich their programme with extra courses.

Note 1

Students wishing to pursue Honours Biology or Honours Biology and Chemistry who elect Physics 121*-122* or Physics 161*-162* in Year 1 would normally be expected to elect Physics 222*-223* ( Electricity and Magnetism) in Year 2 or 3. Biology 131 may, by special permission and if a mark of at least 70% has been obtained, be accepted in place of Biology 132.

Note 2

Students desiring the Biophysics option of the Honours Physics programme are advised to include Biology 131 in their programme.

Students wishing the Theoretical Physics option are advised to select Mathematics 130, 131A*-131B*, and a computing course.

Students desiring the geophysics option of the Honours Physics programme are advised to include Earth Sciences 130 and Chemistry 121*-122* in Year 1.

Students wishing any of the Business Administration options are advised to select Economics 101*-102*. The special four-year General Science and Business Programme also requires Physics (111*-112* recommended), Chemistry (121* and 122*), Earth Sciences 130 and Mathematics 130.

Students wishing the elective programme with Electrical Engineering are advised to select Systems Design 183 (Fall term) and Mathematics 122a* (Winter term).

Note 3

Students in the Co-operative Applied Chemistry programme have two methods of taking Year 1: (i) two terms in a row (September-April) or (ii) fall term on campus (September-December), winter term at work (January-April) and spring term on campus (April-August). Since no first-year Biology or Earth Sciences courses are offered in the spring term (April-August), only students who plan to take two terms in a row may elect these courses. Science 100, a one-term introductory geology course, is available in the Fall term.

Students completing term 1B in the spring must elect both Chemistry 121*-122* and Physics 121*-122* to fulfill the requirement of two Science courses in first year.

Note 4

All Co-operative Applied Physics and Earth Sciences students take Year 1 as two terms in a row (see page 187).

Note 5

Students planning to apply for admission to Year 2 Optometry should note that a year of Chemistry is required for all students lacking a good Chemistry background in Ontario Year 5 or its equivalent — for
### Regular Programmes

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Options Required in Year 1</th>
<th>Options Recommended in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (see Note 1)</td>
<td>Biology 132, Chemistry 121*-122* and 121L*-122L*</td>
<td>Physics 111*-112*, Mthel 101(a) and (b), Earth Sciences 130</td>
</tr>
<tr>
<td>Biology and Chemistry (see Note 1)</td>
<td>Biology 132, Mathematics 130, Chemistry 121*-122* and 121L*-122L*</td>
<td>A first-year Physics course</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Chemistry 121*-122* and 121L*-122L*, Mathematics 130, a full-year Physics course</td>
<td>Biology 131 or 132, Earth Sciences 130, Environmental Studies 195* or a Computer Science course</td>
</tr>
<tr>
<td>Chemistry (Environmental Studies Option)</td>
<td>Chemistry 121*-122* and 121L*-122L*, Mathematics 130, a full-year Physics course</td>
<td>A Computer Science course*</td>
</tr>
<tr>
<td>Chemistry (Mathematics Option)</td>
<td>Chemistry 121*-122* and 121L*-122L*, Mathematics 130, a full-year Physics course, a first-year Algebra course</td>
<td>Mathematics 130</td>
</tr>
<tr>
<td>Chemistry (Physics Option)</td>
<td>Chemistry 121*-122* and 121L*-122L*, Mathematics 130, Physics 121*-122* and 121L*-122L* or 162*-163* and 162L*-163L*</td>
<td>A full-year Algebra course, A Computer Science course*</td>
</tr>
<tr>
<td>Earth Sciences (see Note 6)</td>
<td>Earth Sciences 130, Chemistry 121*-122* and 121L*-122L*</td>
<td>A first-year Physics course, Mathematics 130</td>
</tr>
<tr>
<td>Earth Sciences and Geography</td>
<td>Earth Sciences 130, Chemistry 121*-122* and 121L*-122L*, Geography 102* and one of: Geography 101*, 125R*, 126R*, 127 or Environmental Studies 195*</td>
<td>A full-year Algebra course, Psychology 101*</td>
</tr>
<tr>
<td>Optometry (see Note 5 and page 207 for further details)</td>
<td>Mathematics 130, Biology 132, Physics 111*-112* and 111L*-112L*, Psychology 101*</td>
<td>Chemistry 121*-122* and 121L*-122L*</td>
</tr>
<tr>
<td>Physics (see Note 2)</td>
<td>Mathematics 130, Physics 121*-122* and 121L*-122L* or 162*-163* and 162L*-163L*</td>
<td>Mathematics 131A*-131B*, Chemistry 121*-122* and 121L*-122L*</td>
</tr>
</tbody>
</table>

### Co-operative Programmes

<table>
<thead>
<tr>
<th>Major Field of Study</th>
<th>Options Required in Year 1</th>
<th>Options Recommended in Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Chemistry (See Note 3)</td>
<td>Chemistry 121*-122* and 121L*-122L*, Mathematics 130, a full-year Physics course</td>
<td>Mathematics 131A*-131B*, Chemistry 121*-122* and 121L*-122L*</td>
</tr>
<tr>
<td>Applied Physics (see Notes 2 and 4)</td>
<td>Mathematics 130, Physics 121*-122* and 121L*-122L* or 162*-163* and 162L*-163L*</td>
<td>A first-year Physics course, Mathematics 130</td>
</tr>
<tr>
<td>Co-operative Earth Sciences (see Notes 4 and 6)</td>
<td>Earth Sciences 130, Chemistry 121*-122* and 121L*-122L*</td>
<td>Mathematics 130</td>
</tr>
</tbody>
</table>
these students Chemistry 111*-112* is recommended rather than 121*-122*. Physics 121*-122* 121L*-122L* or 162*-163*, 163L*-163L* may be taken instead of Physics 111*-112*, 111L*-112L*.

Note 6
Earth Science majors planning to enter the co-operative programme and desiring elective courses in Biology should take Biology 131 during their first year.

Note 7
The Ontario Ministry of Education has strongly recommended that all students who are preparing to teach science in high school should take at least one full-year course in Biology.

A brief discussion of the above courses and some other courses available for selection is given below. See Course Descriptions, Chapter 16 of this Calendar for more details.

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.

Faculty of Mathematics Courses
The first year Mathematics courses, 130 (Calculus), 131A*-131B* (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, Science 160* or the sequence Math 122A*-122B* are suggested. Science 160* (Computational Methods in Science) is a Science Faculty course, while Math 122A* (Introduction to Computing) and Math 122B* (Introduction to Computer Science) are offered by the Faculty of Mathematics. Only students who are above average in Mathematics (i.e. approximately 70% or better in at least two Year 5 Mathematics courses) should normally choose three Mathematics courses. Mathematics 101A*-101B* (Applications of Mathematics in the Sciences) is recommended for potential Biology majors.

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 Physics 111*-112*, 121*-122*, 162*-163* and only one of Chemistry 111*-112* or 121*-122*.

Science

Academic Programmes

Biology

Biology 131
Introduction to Biology (2 lectures, 3 hours laboratory).
This course is the normal selection for those wishing a Biology elective in first year and who are not intending to major in Biology or to enter the School of Optometry. It is for all students whether or not Year 5 Biology was taken in secondary school.

Biology 132
Principles of Biology (2 lectures, 3 hours laboratory).
This course is for those wishing to major in Biology or to enter the School of Optometry. It is for all such students whether or not Year 5 Biology was taken in secondary school.

Earth Sciences

Earth Sciences 130
Introductory Geology (2 lectures, 3 hours laboratory).
This course is an ideal elective for first year students who are not familiar with this area. It is not necessary to have a Geography or other specific high school background for this course. Students with potential interest in Geology, Geochemistry, or Geophysics should select this course.

Chemistry

Chemistry 111*
General Chemistry 1 (Prerequisite: Grade 12 Chemistry, 3 lectures, Fall term)
Chemistry 111L*
General Chemistry 1 Laboratory (3 hours laboratory, Fall term)
Chemistry 112*
General Chemistry 2 (Prerequisite: Chemistry 111*, 3 lectures, Winter term)
Chemistry 112L*
General Chemistry 2 Laboratory (3 hours laboratory, Winter term)
Chemistry 121*
Chemical Structure (3 lectures, Fall term)
Chemistry 121L*
Chemical Structure Laboratory (3 hours laboratory, Fall term)
Chemistry 122*
Chemical Reaction (3 lectures, offered in Winter and Spring terms)
Chemistry 122L*
Chemical Reaction Laboratory (3 hours laboratory, offered in Winter and Spring terms)
Chemistry 111*-112* are designed for students who have Not completed Ontario Year 5 chemistry and who may wish to pursue higher level chemistry courses.
Only in exceptional circumstances will this course sequence be open to students who have taken Ontario Year 5 chemistry or its equivalent. Such students should take 121* followed by 122*. Credit will not be allowed for both 111*-112* and 121*-122*. Science students must take the appropriate laboratory courses if the lecture course is chosen.

**Physics**

*Physics 111*
General Physics 1 (3 lectures, and a tutorial period on alternate weeks, Fall term)

*Physics 111L*
General Physics Laboratory 1 (3 hours laboratory on alternate weeks, Fall term)

*Physics 112*
General Physics 2 (3 lectures and a tutorial period on alternate weeks, Winter term)

*Physics 112L*
General Physics Laboratory 2 (3 hours laboratory on alternate weeks, Winter term)

*Physics 121*
Introductory Physics 1 (3 lectures, and a tutorial period on alternate weeks, Fall term)

*Physics 121L*
Introductory Physics 1 Laboratory (3 hours laboratory on alternate weeks, Fall term)

*Physics 122*
Introductory Physics 2 (3 lectures, and a tutorial period on alternate weeks, Winter term)

*Physics 122L*
Introductory Physics 2 Laboratory (3 hours laboratory on alternate weeks, Winter term)

*Physics 162*
Introductory Physics A (3 lectures, and a tutorial period on alternate weeks, Fall term)

*Physics 162L*
Introductory Physics A Laboratory (3 hours laboratory on alternate weeks, Fall term)

*Physics 163*
Introductory Physics B (3 lectures, and a tutorial period on alternate weeks, Winter term)

*Physics 163L*
Introductory Physics B Laboratory (3 hours laboratory on alternate weeks, Winter term)

Any of the above course sequences, 111*-112*, 121*-122* or 162* 163* constitute sufficient preparation for higher year courses in physics. Science students must take the appropriate laboratory course if 121*-122* or 162* 163* is chosen. The laboratory course accompanying 111*-112* is optional.

Physics 121*-122* would be the normal selection for those students intending to continue in a physics major programme. Students of demonstrated ability (at least 75% average in secondary school Year 5 Physics and Functions and Relations and Calculus or their equivalent) who prefer an enriched and slightly more challenging course are encouraged to take Physics 162*-163*. Physics 111*-112* is a one-year survey of the main fields of Physics for students who plan to proceed in Biology, Biology and Chemistry or Earth Sciences. Physics 111L*-112L* is recommended for students who want some practical laboratory experience to complement their theoretical studies or to fulfill entrance requirements of certain medical or dental schools.

Students do not need Year 5 Physics as prerequisites to take 111*-112* although it would be desirable.

**Type A Teaching Certification**

Admission to the Type A Certification programme at the Ontario Colleges of Education requires the completion of a programme of at least twenty full-year University courses, including one or two specialist fields in which the student has obtained at least second class (honours) or equivalent standing. A programme of twenty courses and one specialist field must include at least nine full courses in the field. A programme of twenty courses and two specialist fields must include fourteen full-year courses in the two combined fields, with at least six in each field. The Ontario Ministry of Education approved specialist fields are as follows: Agriculture, Anglais, Art, Biology, Chemistry, Computer Science, Drama or Theatre Arts, Economics, English, Francais, French, Geography, Geology, German, Greek, History, Home Economics, Italian, Latin, Mathematics, Music, Physical and Health Education, Physics, Political Science, Psychology, Russian, Sociology, Spanish.

**Honours Programmes**

The normal route to attain professional standing in Science is to take an Honours Programme in the appropriate field or combination of fields. The Honours Programmes are of four years’ duration and are approximately 22-24 courses in length depending on the programme and in some cases on the electives chosen; they are rather specialized in content, and the syllabus in each is prescribed in terms of a core of compulsory courses plus various electives which allow some flexibility of choice. Students enrolled in a given programme must complete the total number of courses listed for that programme before graduation. Most Honours Programmes allow at least 25% of the courses to be taken as electives of the student’s choice, although recommended courses are shown as a guide. The minimum standard for graduation from any Honours Programme is a cumulative (overall) average of 60% calculated for all courses taken (in any year – whether passed or failed) plus a 60% cumulative average for the major field courses. Those graduating with at least second-class honours standing are granted preferred treatment for post-graduate study in Canadian Universities.
The following Honours Programmes are available

Honours Biology

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology 233</td>
<td>Vertebrate Zoology</td>
<td>2</td>
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<tr>
<td>Biology 234</td>
<td>Plant Biology</td>
<td>2</td>
</tr>
<tr>
<td>Biology 235</td>
<td>Fundamentals of Microbiology</td>
<td>2</td>
</tr>
<tr>
<td>Biology 236</td>
<td>Ecology 1</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 266*</td>
<td>Organic Chemistry 1</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 267*</td>
<td>Organic Chemistry 2</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 267L*</td>
<td>Organic Chemistry Laboratory</td>
<td>0</td>
</tr>
<tr>
<td>One non-Biology elective</td>
<td>(Physics 301*-302* is recommended)</td>
<td>as specified</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Year 3†</th>
<th>At least two full courses from</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology 333</td>
<td>Invertebrate Zoology</td>
</tr>
<tr>
<td>Biology 334*</td>
<td>The Flowering Plants</td>
</tr>
<tr>
<td>Biology 338*</td>
<td>Plant Morphology &amp; Morphogenesis</td>
</tr>
<tr>
<td>Biology 335</td>
<td>Microbial Form and Function</td>
</tr>
</tbody>
</table>

| Year 4 | 5 courses, at least 3 of which are Biology 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. (Chemistry 432*-433* is recommended.) |

Note Regarding Electives | A listing of Science and other electives is found on page 203. 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.

†All Honours Biology students who have completed their third year are required to participate in an off-campus field course before entering Year 4; this will cost each student approximately $100. All students must fulfill this field course requirement to obtain their B.Sc. Honours degree in this programme.
### Honours Biology and Chemistry

#### Year 1
- Normal Year 1 Science (see page 187) in which Chemistry 121*-121L*, 122*-122L*, Biology 132, Mathematics 130 are required; first year Physics is recommended.

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 212*</td>
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<td>Chemistry 220*</td>
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<tr>
<td>Chemistry 220L*</td>
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<td>Chemistry 221*</td>
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<tr>
<td>Chemistry 221L*</td>
<td></td>
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<tr>
<td>Chemistry 264*</td>
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<tr>
<td>Chemistry 264L*</td>
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<tr>
<td>Elective</td>
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</tbody>
</table>

#### Year 2
- Structure and Bonding
- Introductory Analytical Chemistry
- Analytical Chemistry Laboratory 1
- Analytical Chemistry of Multi-Component Systems
- Analytical Chemistry Laboratory 2
- Organic Chemistry 1
- Organic Chemistry Laboratory 1
- One full-year elective or equivalent (Mathematics 31* and one other term course recommended)

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
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<tr>
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<td>Biology 333</td>
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<tr>
<td>Biology 334*</td>
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<td>Biology 335</td>
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<tr>
<td>Biology 341*</td>
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<td>Biology 342</td>
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<tr>
<td>Biology 343*</td>
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<tr>
<td>Biology 344*</td>
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<tr>
<td>Biology 345*</td>
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</tbody>
</table>

#### Note
- Because Year 2 taken in 1974-5 was somewhat different, students entering Year 3 in 1975-6 may have their programme suitably modified. Details will be announced at preregistration.

#### Year 3
- Biochemistry 1 and 2
- General Physical Chemistry 1 and 2
- Organic Chemistry 2
- Organic Chemistry 3
- General Physical Chemistry Laboratory 1 and 2
- Organic Chemistry Laboratory 2

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology 333</td>
<td></td>
<td></td>
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<tr>
<td>Biology 334*</td>
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<td></td>
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<tr>
<td>Biology 338*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology 335</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology 341*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology 342</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology 343*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology 344*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology 345*</td>
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</tbody>
</table>

#### Year 4
- An Introduction to Transition Metal Chemistry
- Biological Aspects of Inorganic Chemistry
- Biochemistry 3 and 4
- Biochemistry 3 and 4 Laboratory

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 316*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 419*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 432*-433*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem 432L*-433L*</td>
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<td></td>
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#### Three of
- Any 400-level courses offered in Biology as specified
Honours Chemistry

Year 1
Normal Year 1 Science (see page 187) including Chemistry 121*-121L*, 122*-122L*, Mathematics 130 and a full-year Physics course.

Year 2
Fall Term
<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 212*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 220*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 220L*</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry 254*</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Mathematics 31*</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>One elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter Term</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 221*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 221L*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 255*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 264*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 264L*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics 243*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics 243L*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One elective</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical Chemistry of Multi-Component Systems</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Analytical Chemistry Laboratory 2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Physical Chemistry 2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Organic Chemistry 1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Organic Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Electricity and Magnetism</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Electricity and Magnetism Laboratory</td>
<td>0</td>
<td>3*</td>
</tr>
</tbody>
</table>

Note: Because Year 2 taken in 1974-5 was somewhat different, students entering Year 3 in 1975-6 may have their programme suitably modified. Details will be announced at preregistration.

Year 3
Fall Term
<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 312*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 314L*</td>
<td>0</td>
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</tr>
<tr>
<td>Chemistry 355*</td>
<td>2</td>
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<tr>
<td>Chemistry 355L*</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 364*</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 364L*</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Two electives†</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter Term</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 313*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 315L*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 358*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 358L*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 365*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two electives†</td>
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</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition Metal Chemistry</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Inorganic Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
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<tr>
<td>Physical Chemistry 3</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Physical Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Organic Chemistry 2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Organic Chemistry Laboratory 2</td>
<td>0</td>
<td>6</td>
</tr>
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</table>

Year 4
<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 492</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Eight one-term electives†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

†In Years 3 and 4, in addition to the required courses, a total of 6 one-term Chemistry courses must be selected from the Chemistry elective courses listed on page 203. At least four of these must be at the 400-level.
Chemistry Electives

**Fall Term**
411*, 420*, 440*, 453*, 454*, 455*, 464*.

**Winter Term**
457*, 465*, 458*.

**Spring Term**
Chemistry 332*, 353*, 354*.

**Note**
Elective courses will be given subject to sufficient
demand as determined at preregistration.

Honours Chemistry (Environmental Studies Option)
This programme is structured to provide the student with a sound knowledge of the
discipline of chemistry together with knowledge of environmental problems,
approaches to their solution, environmental law and resource management.

**Year 1**
Normal Year 1 Science (see page 187) including
Chemistry 121*-121L*, 122*-122L*, Mathematics 130,
and a full-year Physics course. Biology 131 or 132,
Earth Sciences 130, Environmental Studies 195* or a
Computer Science course are considered desirable
electives.

**Year 2**

<table>
<thead>
<tr>
<th>Fall Term</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 212*</td>
<td>Structure and Bonding</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 220*</td>
<td>Introductory Analytical Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 220L*</td>
<td>Analytical Chemistry Laboratory 1</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 254*</td>
<td>Physical Chemistry 1</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics 31*</td>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>Env Studies 195*</td>
<td>Introduction to Environmental Problems</td>
<td>One off</td>
</tr>
<tr>
<td>Man-Env 357*</td>
<td>Conservation and Resource Management</td>
<td>3</td>
</tr>
<tr>
<td>Planning 156*</td>
<td>Introduction to Urban and Regional Planning Concepts</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Winter Term</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 221*</td>
<td>Analytical Chemistry of Multi-Component Systems</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 221L*</td>
<td>Analytical Chemistry Laboratory 2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 255*</td>
<td>Physical Chemistry 2</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 264*</td>
<td>Organic Chemistry 1</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 264L*</td>
<td>Organic Chemistry Laboratory 1</td>
<td>0</td>
</tr>
<tr>
<td>Physics 243*</td>
<td>Electricity and Magnetism</td>
<td>3</td>
</tr>
<tr>
<td>Physics 243L*</td>
<td>Electricity and Magnetism Laboratory</td>
<td>One off</td>
</tr>
<tr>
<td>Env Studies 200*</td>
<td>Field Ecology</td>
<td>3</td>
</tr>
<tr>
<td>Earth Sciences 221*</td>
<td>Geochemistry 1</td>
<td>3</td>
</tr>
</tbody>
</table>
## Year 3

### Fall Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 312*</td>
<td>Transition Metal Chemistry</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 314L*</td>
<td>Inorganic Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 355*</td>
<td>Physical Chemistry 3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 355L*</td>
<td>Physical Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 364*</td>
<td>Organic Chemistry 2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 364L*</td>
<td>Organic Chemistry Laboratory 2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Mathematics 243</td>
<td>Statistics for the Sciences</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

### Winter Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 313*</td>
<td>Main Group Chemistry</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 315L*</td>
<td>Inorganic Chemistry Laboratory 2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry 358*</td>
<td>Physical Chemistry 4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 358L*</td>
<td>Physical Chemistry Laboratory 2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry 365*</td>
<td>Organic Chemistry 3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Mathematics 243</td>
<td>Statistics for the Sciences</td>
<td>2</td>
<td>1</td>
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</tbody>
</table>

### Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env Studies 400</td>
<td>Environmental Management</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Chemistry 492</td>
<td>Advanced Laboratory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four one-term courses</td>
<td>(Recommended courses include: Chemistry 311*</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>320*-320L*, 332*-332L*, 419*, 420*, 455*)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes

1. The courses indicated as options need not be taken in the order listed. For example, a 300-level course could be taken in second year. Course options not elected in a previous year may be selected with the consent of the undergraduate officer in a subsequent year. The student should be careful, however, to select courses that are prerequisites as early in the programme as feasible, thus ensuring maximum flexibility in the course selection of upper years. The choice of Biology 131 or 132 in Year 1 would permit choice of certain Year 2 Biology courses.

2. A student may not select both Environmental Studies 200* and Science 451* for credit.
Honours Chemistry (Mathematics Option)

Year 1
As for Honours Chemistry (see page 187) a first year course in Algebra is also required and at least one term of Computer Science is recommended.

Year 2

<table>
<thead>
<tr>
<th>Term</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Term</td>
<td>Chemistry 212*</td>
<td>Structure and Bonding</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Chemistry 220*</td>
<td>Introductory Analytical Chemistry</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Chemistry 220L*</td>
<td>Analytical Chemistry Laboratory 1</td>
<td>0</td>
<td>6</td>
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<tr>
<td></td>
<td>Chemistry 254*</td>
<td>Physical Chemistry 1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Mathematics 31*</td>
<td>Differential Equations</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>or Math 314A*</td>
<td>Introduction to Scientific Computation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Math 237 or 217</td>
<td>Advanced Calculus</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>or Math 229 or 219</td>
<td>Linear Algebra</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Winter Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 221*</td>
<td>Analytical Chemistry of Multi-Component Systems</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 221L*</td>
<td>Analytical Chemistry Laboratory 2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 255*</td>
<td>Physical Chemistry 2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 264*</td>
<td>Organic Chemistry 1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 264L*</td>
<td>Organic Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Physics 243*</td>
<td>Electricity and Magnetism</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Physics 243L*</td>
<td>Electricity and Magnetism Laboratory</td>
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</tr>
<tr>
<td>Math 237 or 217</td>
<td>Advanced Calculus</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>or Math 229 or 219</td>
<td>Linear Algebra</td>
<td>3</td>
<td>0</td>
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</tbody>
</table>

Note 1: *Mathematics 314* may replace Mathematics 31* in the Core.

Note 2: Because Year 2 taken in 1974-5 was somewhat different, students entering Year 3 in 1975-6 may have their programme suitably modified. Details will be announced at preregistration.

Year 3

Fall Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 312*</td>
<td>Transition Metal Chemistry</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 314L*</td>
<td>Inorganic Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 355*</td>
<td>Physical Chemistry 3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 355L*</td>
<td>Physical Chemistry Laboratory 1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 364*</td>
<td>Organic Chemistry 2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 364L*</td>
<td>Organic Chemistry Laboratory 2</td>
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<td>3</td>
</tr>
<tr>
<td>One elective</td>
<td></td>
<td></td>
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</table>

Winter Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 313*</td>
<td>Main Group Chemistry</td>
<td>2</td>
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<tr>
<td>Chemistry 315L*</td>
<td>Inorganic Chemistry Laboratory 2</td>
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<tr>
<td>Chemistry 358*</td>
<td>Physical Chemistry 4</td>
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<td>0</td>
</tr>
<tr>
<td>Chemistry 358L*</td>
<td>Physical Chemistry Laboratory 2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry 365*</td>
<td>Organic Chemistry 3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>One elective</td>
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</table>

Year 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 492</td>
<td>Advanced Laboratory</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

Four one-term Chemistry courses of which two must be at the 400-level.
Four one-term (or equivalent) Mathematics courses at the 300- or 400-level.
Honours Chemistry (Physics Option)

**Year 1**
As for Honours Chemistry (see page 187) the first year Physics course selected should be 121*-121L*, 122*-122L* or 162*-162L*, 163*-163L*. A full-year course in Algebra and at least one term of Computer Science is recommended.

**Year 2**

<table>
<thead>
<tr>
<th>Fall Term</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 212*</td>
<td>Structure and Bonding</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 220*</td>
<td>Introductory Analytical Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 220L*</td>
<td>Analytical Chemistry Laboratory 1</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 254*</td>
<td>Physical Chemistry 1</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics 22*</td>
<td>Calculus 2</td>
<td>3</td>
</tr>
<tr>
<td>Physics 222* or 252*</td>
<td>Electricity and Magnetism 1</td>
<td>2</td>
</tr>
<tr>
<td>Phys 222L* or 252L*</td>
<td>Electricity and Magnetism Laboratory 1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Winter Term</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 221*</td>
<td>Analytical Chemistry of Multi-Component Systems</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 221L*</td>
<td>Analytical Chemistry Laboratory 2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 255*</td>
<td>Physical Chemistry 2</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 264*</td>
<td>Organic Chemistry 1</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 264L*</td>
<td>Organic Chemistry Laboratory 1</td>
<td>0</td>
</tr>
<tr>
<td>Mathematics 31*</td>
<td>Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>Physics 223* or 253*</td>
<td>Electricity and Magnetism 2</td>
<td>2</td>
</tr>
<tr>
<td>Phys 223L* or 253L*</td>
<td>Electricity and Magnetism Laboratory 2</td>
<td>0</td>
</tr>
</tbody>
</table>

**Note**
Because Year 2 taken in 1974-5 was somewhat different, students entering Year 3 in 1975-6 may have their programme suitably modified. Details will be announced at preregistration.

**Year 3**

<table>
<thead>
<tr>
<th>Fall Term</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 312*</td>
<td>Transition Metal Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 314L*</td>
<td>Inorganic Chemistry Laboratory 1</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 355*</td>
<td>Physical Chemistry 3</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 355L*</td>
<td>Physical Chemistry Laboratory 1</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 364*</td>
<td>Organic Chemistry 2</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 364L*</td>
<td>Organic Chemistry Laboratory 2</td>
<td>0</td>
</tr>
<tr>
<td>Physics 324*</td>
<td>Atomic and Nuclear Physics 1</td>
<td>3</td>
</tr>
<tr>
<td>Elective†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Winter Term</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 313*</td>
<td>Main Group Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 315L*</td>
<td>Inorganic Chemistry Laboratory 2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 358*</td>
<td>Physical Chemistry 4</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry 358L*</td>
<td>Physical Chemistry Laboratory 2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 365*</td>
<td>Organic Chemistry 3</td>
<td>2</td>
</tr>
<tr>
<td>Physics 325*</td>
<td>Atomic and Nuclear Physics 2</td>
<td>3</td>
</tr>
<tr>
<td>Elective†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Year 4**

| Chem 492               | Advanced Laboratory | 0 | 9 |
| Two one-term Chemistry courses which must be at the 400-level. |
| Four one-term Physics courses at the 300- or 400 level. |
| Two one-term electives. |

†Year 3 electives may be chosen from: Physics 352*-353* plus 352L*-353L*, 362*-363*, 364*-365*, Mathematics 219, 312b*, 314a*. 
**Co-operative Applied Chemistry (Honours)**

Information about the Co-op work terms and the Co-ordination Department can be found in Chapter 6. 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 more course electives and opportunities exist and to graduate at the same time in May.

### Year 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Year 1 Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemistry 121*-121L*, 122*-122L*, Mathematics 130 and a full-year Physics course</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Year 2A

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 212*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 220*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 220L*</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry 254*</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Mathematics 31*</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>One elective</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Year 2B

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 221*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 221L*</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 255*</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 264*</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 264L*</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Physics 243*</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Physics 243L*</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>One elective</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**

_Because Year 2 taken in 1974-5 was somewhat different, students entering Year 3 in 1975-6 may have their programme suitably modified. Details will be announced at preregistration._

### Year 3A

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 312*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 314L*</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 355*</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 355L*</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 364*</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry 364L*</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Two electives†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Year 3B

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 313*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 315L*</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry 358*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Chemistry 358L*</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Chemistry 365*</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Two electives†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry 492</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Eight electives†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*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 five one-term courses be selected from: Chemistry 311*, 320*-, 320L*, 353*, 354*, 363*, 416*, 420* or 421*, 453* or 457*, 454*, 455*, 456*.

Other electives may be chosen from the Chemistry Electives listed on page 203.
Honours Earth Sciences (Geology Option)

(For a complete discussion of Year 1, see page 187)

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 221*</td>
<td>Geochemistry 1</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 231*</td>
<td>Mineralogy</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 232*</td>
<td>Petrography</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 235*</td>
<td>Stratigraphy</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 236*</td>
<td>Principles of Paleontology</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 260*</td>
<td>Introductory Structural Geology</td>
<td>2</td>
</tr>
</tbody>
</table>

Electives

Three full year electives (or their equivalent) as follows:

Science elective: Physics 111*-112*, General Physics, or an equivalent physics course.

Mathematics elective: By the end of Year 2, students will be required to have completed Mathematics 130, Calculus, and a course involving computer programming (for example Mathematics 122a* or 132a*, or General Engineering 121*).

Note

For students who completed the Science or Mathematics electives in Year 1, the following electives are recommended:

Biology 131, Introduction to Biology (or a second or third year Biology course); Mathematics 236, Elementary Differential Equations; Physics 259*, 259L*, Crystallography and X-ray Diffraction; Chemistry 356*-357*, 356L*-357L*, General Physical Chemistry 1 and 2.

Consult Department for list of other Science electives.

Arts elective: as specified.

<table>
<thead>
<tr>
<th>Year 3</th>
<th>Lectures</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 331*</td>
<td>Igneous Petrology</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 332*</td>
<td>Metamorphic Petrology</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 333*</td>
<td>Sedimentology 1</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 336*</td>
<td>Paleontology</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 342*</td>
<td>Geomorphology</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 345*</td>
<td>Historical Geology</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 360*</td>
<td>Introduction to Applied Geophysics</td>
<td>3</td>
</tr>
<tr>
<td>Earth Sciences 370*</td>
<td>Geology of non-renewable Primary Resources</td>
<td>3</td>
</tr>
<tr>
<td>Arts Elective</td>
<td>as specified</td>
<td></td>
</tr>
</tbody>
</table>

One full-year course or equivalent from:

Earth Sciences 355* Mathematical Geology 1 (strongly recommended) | 3 | 0

Biology 333 Invertebrate Zoology | 2 | 3

Physics 250* The Solar System | 3 | 0

Physics 251* The Stellar System | 3 | 0

or

Other Science elective as specified
<table>
<thead>
<tr>
<th>Year 4</th>
<th>Lect.</th>
<th>Lab.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 436</td>
<td>Thesis</td>
<td>0</td>
</tr>
<tr>
<td>Earth Sciences 427*</td>
<td>Crustal Evolution</td>
<td>2</td>
</tr>
<tr>
<td>One non-Earth Sciences elective</td>
<td>as specified</td>
<td></td>
</tr>
</tbody>
</table>

Seven half-courses from:

| Earth Sciences 421* | Geochemistry 2 | 3 | 2 |
| Earth Sciences 432* | Precambrian Geology | 2 | 2 |
| Earth Sciences 433* | Sedimentology 2 | 2 | 3 |
| Earth Sciences 434* | Biostratigraphy | 2 | 2 |
| Earth Sciences 435* | Advanced Structural Geology | 3 | 2 |
| Earth Sciences 438* | Engineering Geology | 2 | 1 |
| Earth Sciences 439* | Groundwater Geology | 3 | 0 |
| Earth Sciences 440* | Quaternary Geology | 2 | 3 |
| Earth Sciences 456* | Mathematical Geology 2 | 3 | 0 |
| Earth Sciences 461* | Applied Geophysics | 2 | 2 |
| Earth Sciences 470* | Metallic Mineral Deposits | 3 | 2 |

Honours Earth Sciences and Geography

Year 1

(For a complete discussion of Year 1, see page 187)

| Earth Sciences 130 | Introductory Geology | 2 | 3 |
| Geography 102* | Introduction to Physical Geography | 2 | 2 |
| Chemistry 121* | Chemical Structure | 3 | 0 |
| Chemistry 121L* | Chemical Structure Laboratory | 0 | 3 |
| Chemistry 122* | Chemical Reaction | 3 | 0 |
| Chemistry 122L* | Chemical Reaction Laboratory | 0 | 3 |

One of:

| Geography 101* | Introduction to Human Geography | 2 | 1 |
| Geography 125R* | Introduction to the Developing World | 3 | 0 |
| Geography 126R* | The Emerging Third World | 3 | 0 |
| Geography 127* | Regional Problems of Europe | 2 | 0 |
| Env Studies 195* | Introduction to Environmental Problems | 2 | 1 |
| Two electives | as specified | |

Year 2

| Earth Sciences 221* | Geochemistry 1 | 2 | 3 |
| Earth Sciences 231* | Mineralogy | 2 | 3 |
| Earth Sciences 232* | Petrography | 2 | 3 |
| Earth Sciences 235* | Stratigraphy | 2 | 2 |
| Earth Sciences 236* | Principles of Paleontology | 2 | 2 |
| Earth Sciences 260* | Introductory Structural Geology | 2 | 2 |
| Env Studies 200* | Field Ecology | 2 | 2 |
| Geography 201* | Some Basic Topics of Physical Geography | 2 | 2 |
| Geography 320 | Some Basic Topics of Economic and Urban Geography | 2 | 1 |
| Geography 202* | Three one-term electives (or equivalent) | |

including one of:

| Geography 203* | Geography of Population | 2 | 1 |
| Geography 232* | World Regional Geography | 2 | 2 |
### Year 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Lect.</th>
<th>Lab.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 331* Igneous Petrology</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Earth Sciences 332* Metamorphic Petrology</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Earth Sciences 333* Sedimentology 1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Earth Sciences 336* Paleontology</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 342* Geomorphology</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Earth Sciences 345* Historical Geology</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 360* Introduction to Applied Geophysics</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 370* Geology of non-renewable Primary Resources</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>One Geog elective (full-year course or equivalent)</td>
<td>as specified</td>
<td></td>
</tr>
<tr>
<td>One elective (full-year course or equivalent)</td>
<td>as specified</td>
<td></td>
</tr>
</tbody>
</table>

### Year 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Lect.</th>
<th>Lab.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 436 Honours Thesis</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Three other Earth Sciences courses at the 400 level
One full-year Geography elective
One elective

### Co-operative Earth Sciences (Honours)

Earth Science Majors  *(For a complete discussion of Year 1, see page 187)*

The Co-operative programme in Earth Sciences is an Honours programme designed to satisfy the requirement of many potential employers that graduating geologists have practical experience as well as good academic training. In the first year, students take the regular Year 1 Science programme selecting options necessary for Earth Science majors. The Co-operative Earth Sciences programme will begin in the fall term of the second year and will be operated as a single co-operative stream. The first work term begins in the Winter term following the Fall term 2A and thereafter academic and work terms alternate until the Winter following term 3B when a double work term commences. Students then take their terms 4A and 4B as a full academic year, graduating the following Spring.

General features and conditions of the Co-operative plan at the University of Waterloo are given in Chapter 6.

<table>
<thead>
<tr>
<th>F - Fall</th>
<th>W - Winter</th>
<th>S - Spring</th>
<th>Wk Tm - Work Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>W</td>
<td>S</td>
<td>F</td>
</tr>
<tr>
<td>2A</td>
<td>Wk Tm 1</td>
<td>2B</td>
<td>Wk Tm 2</td>
</tr>
</tbody>
</table>

The normal progress of a student entering Co-operative Earth Sciences in his second academic year in the Fall of 1975 is shown in the table above. The core and elective programme descriptions follow.

### Year 2A

<table>
<thead>
<tr>
<th>Course</th>
<th>Lect.</th>
<th>Lab.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 231* Mineralogy</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Earth Sciences 236* Principles of Paleontology</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 235* Stratigraphy</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Plus 3 one-term electives, one of which should be an Arts elective. Note that Mathematics 130 (Calculus) or its equivalent and at least a one-term course in Computer Science (General Engineering 121* or Mathematics 122a* recommended) must be completed by the end of second year. Similarly, Physics 111*-112* or an equivalent Physics course should be completed by the end of second year.
### Year 2B

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 221*</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 232*</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 260*</td>
<td>2</td>
</tr>
<tr>
<td>Geochemistry 1</td>
<td>3</td>
</tr>
<tr>
<td>Petrography</td>
<td>3</td>
</tr>
<tr>
<td>Introductory Structural Geology</td>
<td>2</td>
</tr>
</tbody>
</table>

### Year 3A

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 332*</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 333*</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 345*</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 370*</td>
<td>3</td>
</tr>
<tr>
<td>Metamorphic Petrology</td>
<td>3</td>
</tr>
<tr>
<td>Sedimentology 1</td>
<td>2</td>
</tr>
<tr>
<td>Historical Geology</td>
<td>2</td>
</tr>
<tr>
<td>Geology of non-renewable Primary Resources</td>
<td>2</td>
</tr>
</tbody>
</table>

Plus 1 Science and 1 Arts one-term elective or equivalent

(Physics 369* – Geology of the Ocean Basins may be taken as a Science elective)

### Year 3B

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Sciences 331*</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 336*</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 342*</td>
<td>2</td>
</tr>
<tr>
<td>Earth Sciences 360*</td>
<td>3</td>
</tr>
<tr>
<td>Igneous Petrology</td>
<td>3</td>
</tr>
<tr>
<td>Paleontology</td>
<td>2</td>
</tr>
<tr>
<td>Geomorphology</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Applied Geophysics</td>
<td>2</td>
</tr>
</tbody>
</table>

Plus 1 Science and 1 Arts one-term elective or equivalent.

Earth Sciences 355*, Mathematical Geology 1 is strongly recommended as background for Earth Sciences 421*, 438*, 439* and 461* and is prerequisite for 456* in fourth year. Physics 368* – Introductory Topics on Physics of the Earth may also be taken as a Science elective.

### Year 4A, 4B

Identical to Regular programme in Honours Earth Sciences.

### Honours Physics

The Honours programme is in the form of a core of required courses, plus appropriate electives. The elective courses may be chosen from a wide range of courses offered by the Physics Department and by other departments of the University. By careful selection of his electives, a student can deepen his knowledge of experimental or theoretical physics, or obtain a background in another subject (e.g. Astronomy, Geophysics, Chemistry, Mathematics, Computing, Business Administration). The choice of electives must be made to fit the student’s timetable, and must be approved by the Chairman of the Department of Physics.

The programme must include a total of twenty-four course credits (including year one). It is recommended that students intending to take an Honours Physics programme should take six course credits in first year. Examples of possible elective programmes are given on the pages following the core programme which is listed below. Detailed descriptions of the courses start in Chapter 16.

### Year 1

(For a complete discussion of Year 1, see page 187)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 252*-253*</td>
<td>1.00</td>
</tr>
<tr>
<td>Phys 252L*-253L*</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 256*</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 256L*</td>
<td>.25</td>
</tr>
<tr>
<td>Physics 255*</td>
<td>.50</td>
</tr>
<tr>
<td>Mathematics 237</td>
<td>1.00</td>
</tr>
<tr>
<td>Mathematics 31*</td>
<td>.50</td>
</tr>
</tbody>
</table>

Note 1: Mathematics 31* may be replaced by Mathematics 236.

Note 2: If Physics 265* is elected, Physics 253L* may be omitted.
<table>
<thead>
<tr>
<th><strong>Year 3</strong></th>
<th><strong>Core</strong></th>
<th><strong>Course Credits</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 360A*</td>
<td>Intermediate Laboratory</td>
<td>.25</td>
</tr>
<tr>
<td>Physics 360B*</td>
<td>Intermediate Laboratory</td>
<td>.25</td>
</tr>
<tr>
<td><em>Two of: Physics 371A</em>, 371B*, 352L* or 353L*</td>
<td></td>
<td>.50</td>
</tr>
<tr>
<td>Physics 362*-363*</td>
<td>Classical Mechanics 1 and 2</td>
<td>1.00</td>
</tr>
<tr>
<td>Physics 365*</td>
<td>Mathematical Physics 2</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 354*</td>
<td>Atomic and Molecular Physics</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 358*</td>
<td>Thermodynamics</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 359*</td>
<td>Statistical Mechanics</td>
<td>.50</td>
</tr>
</tbody>
</table>

**Note 1**

*Students desiring Physics 444* must elect Physics 355*.  

**Note 2**

*Physics 364* is recommended.

<table>
<thead>
<tr>
<th><strong>Year 4</strong></th>
<th><strong>Core</strong></th>
<th><strong>Course Credits</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics 434A*</td>
<td>Introductory Quantum Mechanics</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 441</td>
<td>Electromagnetic Theory</td>
<td>1.00</td>
</tr>
<tr>
<td>Physics 355*</td>
<td>Nuclear and Particle Physics (if not taken in Year 3)</td>
<td>.50</td>
</tr>
</tbody>
</table>

**Note**

*Physics 434B* is strongly recommended for students intending to do graduate work.*
Elective Programmes
The flexibility of this “core plus electives” structure is demonstrated by the following examples of possible programmes, all of which are sufficient preparation for graduate work in Physics, although each has a slightly different emphasis. Details of other possible programmes may be obtained from the Chairman of the Physics Department. In choosing electives, the student should make sure that his programme contains a minimum of 24 course credits.

Ex 1 Honours Physics
(with extra emphasis on experimental physics)
Core plus: Year 2
Physics 259*, 259L*, 270*-271*, Mathematics 240a* and 240b*
Core plus: Year 3
Physics 352*-353*, 352L*-353L*, 364*, 371A*, 371B*
Core plus: Year 4
Physics 432*, 433*, 435*, 464*, 465*
Two of: Physics 442*, 443*, 445*, 452*, 453*

Ex 2 Honours Physics
(especially suitable as preparation for secondary school teaching)
Core plus: Year 2
Physics 265*, 250*-251*, Mathematics 240a*
Core plus: Year 3
Core plus: Year 4
Physics 433 or 437*, 435*, Chemistry 356*-357*, Science 400, Arts Electives totalling .50 or 1.00 credit

Ex 3 Honours Physics
(with Biophysics)
Core plus: Year 2
Mathematics 223A
Three of: Chemistry 254*, 255*, 266*, 267*, Biology 245*, 246*
Core plus: Year 3
Four of: Physics 352*, 352L*, 353*, 353L*, 364*, 380*, 381*
One of: Biology 341*, 343*, 344*, Chemistry 356*, 357*, 332*, 333*, 353*
Core plus: Year 4
Physics 433*, 434B*, 435*, 480*, 481*
2.00 credits from Biology 434, 448, 449,

Chemistry 432*, 433*, 434*, 453*, 454*, 457*

Ex 4 Honours Physics
(with Computing)
Core plus: Year 2
Physics 259*, 259L*, Mathematics 240a*-240b*, Physics 265* or Arts Elective*
Core plus: Year 3
Core plus: Year 4
Physics 435*, 452*, 453*, E.E. 324*, Physics 433 or 437*, electives totalling 1.00 or 1.50 credits

Ex 5 Honours Physics
(with Chemistry)
Core plus: Year 2
Chemistry 218*-219*, 254*-255*, Mathematics 240a* or 240b*
Core plus: Year 3
Physics 352*, 352L*, 364*, 371A*, Chemistry 266*-267*, Elective*
Core plus: Year 4
2.00 credits from Physics 434B*, 435*, Chemistry 350*, 355*, 358*, 312*, 311*, Elective*

Ex 6 Honours Physics
(with Astrophysics)
Core plus: Year 2
Physics 250*, 251*, 270*, Mathematics 240a*-240b*
Core plus: Year 3
Physics 364*; two of: 350*, 351*, 352*-352L*, 353*-353L*, 449*, 450*, 451*, Arts Electives totalling 1.00 credit
Core plus: Year 4

Ex 7 Honours Physics
– Business Administration Option
See comments regarding the Business Administration Option on page 216.
Core plus: Year 1 Special Requirements
Economics 101*, 102*, Mathematics 112A*, 112B*
Core plus: Year 2
Economics 201*-202*, 191*-192*

Core plus: Year 3
Business (WLU) 212*-222*, 285*-295*, Management Sciences 406*

Core plus: Year 4
Economics 393*-394*, Business (WLU) 385*-395*, 388*-398*, Management Sciences 407*
(Physics 360A* and 360B* are not normally taken with this option)

Ex 8 Honours Physics
(with Geophysics)

Core plus: Year 2
Physics 259*, 259L*, Earth Sciences 231*, 235*, 241*

Core plus: Year 3
Physics 368*, 369*, Earth Sciences 260*, 1.0 credit from Earth Sciences

Core plus: Year 4
Four credits from: Physics 352*-352L*, 353*-353L*, 433*, 438*, Mathematics 240, selected Earth Science courses

Ex 9 Honours Physics
(with Electrical Engineering)

Core plus: Year 1 Special Requirements
Systems Design 183 (Fall term), and Mathematics 122a* (Winter term)

Core plus: Year 2
Physics 259*, 259L*, Electrical Engineering 221, 241

Core plus: Year 3
Physics 352*, 353*, 352L*, 353L*, Electrical Engineering 316 and one or two of Electrical Engineering 324, 380, 261

Note
It may be possible to replace Physics 360a*-360b* by an Electrical Engineering course if two of the Electrical Engineering courses chosen have labs associated with them.

Core plus: Year 4
Physics 433, 435*, 453*, Electrical Engineering 428, 429, 435, 436

Theoretical Physics Programme
Students with an interest in theoretical physics may wish to emphasize the more mathematical aspects of the subject. A suitable programme consists of the "Honours Physics" core plus the following elective scheme:

Core plus: Year 2
Physics 259*, 259L*, Mathematics 229, elective*

Core plus: Year 3
Physics 355*, 364*, Mathematics Elective, elective*

Core plus: Year 4
Physics 431*, 434B*, 435*, 437*, 464*, 465*, plus 1½ electives

Note
Students interested in this programme are advised to take Mathematics 130, 131A*-131B*, and a computing course in Year 1 to ensure having the necessary prerequisites for later year Mathematics courses.

Suggested Mathematics electives are the following: Mathematics 334a*-334b*, 351a*-351b*, 352a*-352b*, 360a*, 361a*, 371a*-371b*, 372b*, 413, 417, 453a*, 453b*, 464*, 474d*, 480.

Co-operative Applied Physics (Honours)
Applied Physics in an Honours programme in the form of a core of required courses plus appropriate electives. The electives available in the second, third and fourth years allow students to strengthen complementary areas of interest whether in some specific field in physics or in some other subject area.

Through the Co-operative part of the programme Applied Physics students have the opportunity of exposure to practical research and development situations in Government and Industry. Work opportunities, which are available on a competitive basis, are co-ordinated to complement the student's course work and interests where possible. Many work term experiences, especially in the upper year, provide the student with a deeper insight into the meaning and methods of research as well as an incentive to develop course work. Such experience provides a contribution to the development of a scientist which cannot be learned in lecture courses, and helps prepare an individual to apply a fundamental physics background to the solution of practical problems.

The programme must include a total of twenty-four course credits (including Year One). It is recommended that students intending to take an honours physics programme should take six 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 16.

The following table shows the normal progress of students in the Applied Physics programme. This arrangement has been found advantageous since it provides more relevant work experience in senior years.
Further information about the Co-Operative work terms and the Co-ordination Department can be found starting in Chapter 6.

### Year 1

(For a complete discussion of Year 1, see page 187)

#### Year 2A

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
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<td>Physics 256*</td>
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<tr>
<td>Physics 256L*</td>
<td>.25</td>
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<tr>
<td>Mathematics 237a*</td>
<td>.50</td>
</tr>
<tr>
<td>Mathematics 31*</td>
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#### Year 2B

<table>
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<tbody>
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<tr>
<td>Physics 253L*</td>
<td>.25</td>
</tr>
<tr>
<td>Physics 255*</td>
<td>.50</td>
</tr>
<tr>
<td>Mathematics 237b*</td>
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**Note**

*Physics 265 is recommended.*

#### Year 3A

<table>
<thead>
<tr>
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<td>Physics 358*</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 360A*</td>
<td>.25</td>
</tr>
<tr>
<td>Physics 362*</td>
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</table>

**Note**

*Physics 364* is recommended.*

#### Year 3B

<table>
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<tbody>
<tr>
<td>Physics 360B*</td>
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<tr>
<td>Physics 359*</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 363*</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 365*</td>
<td>.50</td>
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</table>

**Note**

*Students taking Physics 444* must elect Physics 355*.

#### Year 4A - 4B

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Physics 434A*</td>
<td>.50</td>
</tr>
<tr>
<td>Physics 441</td>
<td>1.00</td>
</tr>
<tr>
<td>Physics 355*</td>
<td>.50</td>
</tr>
</tbody>
</table>
Note

Physics 434B* is strongly recommended for students intending to do graduate work.

Options

Some suggested programmes are given below.
In choosing his electives the student should make sure that his programme contains a minimum of 24 course credits.

<table>
<thead>
<tr>
<th>Ex 1 Co-op Applied Physics (Solid State)</th>
<th>Ex 3 Co-op Applied Physics (with Chemistry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core plus: Year 2A</td>
<td>Core plus: Year 2A</td>
</tr>
<tr>
<td>Physics 270*, Mathematics 240b*</td>
<td>Chemistry 254*, 212*</td>
</tr>
<tr>
<td>Core plus: Year 2B</td>
<td>Core plus: Year 2B</td>
</tr>
<tr>
<td>Physics 259*, 259L*, 271*, Chemistry 311* or Mathematics 240a*</td>
<td>Chemistry 264*, Physics, 259*, 259L*, Arts Elective*</td>
</tr>
<tr>
<td>Core plus: Year 3A</td>
<td>Core plus: Year 3A</td>
</tr>
<tr>
<td>Core plus: Year 3B</td>
<td>Core plus: Year 3B</td>
</tr>
<tr>
<td>Core plus: Year 4A</td>
<td>Core plus: Year 4A</td>
</tr>
<tr>
<td>Physics 433, 435*, 452*, 464*</td>
<td>Physics 433, 435*, 436A*, Chemistry 332* or 353* or 455*</td>
</tr>
<tr>
<td>Core plus: Year 4B</td>
<td>Core plus: Year 4B</td>
</tr>
<tr>
<td>Physics 433, 434B*, 442*, 453*, 465*</td>
<td>Physics 433, 434B*, Chemistry 332* or 333*</td>
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<table>
<thead>
<tr>
<th>Ex 2 Co-op Applied Physics (Biophysics)</th>
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<tr>
<td>Core plus: Year 2A</td>
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</tr>
<tr>
<td>1.00 credit from: Chemistry 254*, 266*, Biology 245*, 303*, 341*, 344*, Physics 380*</td>
<td>Mathematics 219a*, 240b*</td>
</tr>
<tr>
<td>Core plus: Year 2B</td>
<td>Core plus: Year 2B</td>
</tr>
<tr>
<td>1.00 credit from: Chemistry 255*, 267*, 332*, 353*, Physics 265*</td>
<td>Mathematics 219b*, 240a*, Physics 259*, 259L*</td>
</tr>
<tr>
<td>Core plus: Year 3A</td>
<td>Core plus: Year 3A</td>
</tr>
<tr>
<td>Core plus: Year 3B</td>
<td>Core plus: Year 3B</td>
</tr>
<tr>
<td>Core plus: Year 4A and 4B</td>
<td>Core plus: Year 4A</td>
</tr>
<tr>
<td>Ex 4 Co-op Applied Physics (with Computing)</td>
<td></td>
</tr>
<tr>
<td>Core plus: Year 2A</td>
<td>Core plus: Year 2A</td>
</tr>
<tr>
<td>Mathematics 219a*, 240b*</td>
<td>Mathematics 219b*, 240a*, Physics 259*, 259L*</td>
</tr>
<tr>
<td>Core plus: Year 3A</td>
<td>Core plus: Year 3A</td>
</tr>
<tr>
<td>Core plus: Year 4A</td>
<td>Core plus: Year 4A</td>
</tr>
<tr>
<td>Mathematics 334a*, Physics 435*, 452*, 464*</td>
<td>Mathematics 334b*, Physics 453*, 455*</td>
</tr>
<tr>
<td>Ex 5 Co-op Applied Physics Business Administration Option</td>
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</tr>
<tr>
<td>See comments regarding Business Administration Option on page 216.</td>
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</tbody>
</table>

Core plus: Year 1 Special Requirements
Economics 101*—102*, Mathematics 122A* or 112A*
Core plus: Year 2
Economics 201*-202*, 191*-192*

Core plus: Year 3
Business (WLU) 212*-222*, 255*-275*, Management Sciences 407*

Core plus: Year 4
Economics 393*-394*, Business (WLU) 385*-395*, 388*-398*, Management Sciences 407*
(Physics 360A* and 360B* are not normally taken with this Option).

Ex 6 Co-op Applied Physics
(with Electrical Engineering)
Core plus: Year 1 Special Requirements
Systems Design 183 (Fall term), and Mathematics 122a*
(Winter term).

Core plus: Year 2A
Electrical Engineering 221

Core plus: Year 2B
Physics 259*, 259L*, Electrical Engineering 316

Core plus: Year 3A
Physics 352*, 352L*

Core plus: Year 3B
Physics 353*, 353L*, Electrical Engineering 241 and one or two of Electrical Engineering 324, 380

Note
It may be possible to replace Physics 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

Optometry Programme

Within the Science Faculty, the School of Optometry offers a five year programme leading to the degree Doctor of Optometry. The first is a pre-professional year preparatory to the four years of the professional optometry programme.

The immediate purpose of the programme is to qualify men and women for the practice of Optometry. However, the programme is designed to provide students with sufficient general and specialized knowledge in Science so that they may follow a career in research and teaching if so desired. Students who desire to transfer from Optometry to other areas in Science, especially General Science, may do so at any time, although it is best to do so after Years 1 or 2. Students thus transferring will receive credit for all appropriate courses taken and will then take whatever courses are necessary to complete the programme chosen.

Upon completion of their training in Optometry, graduates will be eligible to apply for registration as optometrists in the province of their choice or to undertake Graduate Studies. Graduate training will lead to the degrees of Master of Science and Doctor of Philosophy. A graduate programme in Physiological Optics, leading to the Master of Science degree, is now available.

Inquiries regarding admission requirements should be sent to the Assistant Registrar, Faculty of Science. Specific admissions requirements and regulations for Examinations and Standings may be found on page 182. The Optometry programme requires the same academic standard as do the Honours programmes in the Faculty. All other inquiries relating to the course should be sent to the Undergraduate Officer of the School of Optometry at the University.

Students who enrol at the University of Waterloo and intend to proceed in Optometry should register in Year 1 Regular Science and should receive counselling regarding the prerequisites for continuing in Optometry in their second year. All University of Waterloo students interested in applying for Optometry should preregister for the first professional year (Year 2 Optometry) during the spring preregistration period. At that time an interview with a faculty member will be arranged for the student. All applicants should note that enrolment in the first professional year is limited and that neither acceptance to nor successful completion of the pre-professional programme guarantees admission to the first professional year. Applicants are selected on a competitive basis considering scholarship, interest, motivation, general qualifications for the profession and recommendations. While admissions of well-qualified applicants are made from all provinces, prospective students are advised that some preferential consideration must be given to Ontario residents.
The admissions committee cannot at this time accept applications from those on student visas and priority is granted in admissions to Canadian citizens.

Students who have met the University's requirements for admission to the pre-professional year and who have in addition completed satisfactorily at another University a programme equivalent to the pre-professional year as given at the University of Waterloo may apply for direct admission to the first professional year (Year 2) of the Optometry programme. The general guidelines for admission stated in the preceding paragraphs should be noted. Applicants should also be aware that preferential consideration in admissions to the first professional year is given to students completing their pre-professional requirements at the University of Waterloo.

Students applying from other universities should request an application form no earlier than January. Completed applications for the School of Optometry will not be accepted after May 1. The academic transcripts, letters of reference and other material required in the admissions procedure must be received no later than June 15. It is expected that decisions of the admissions committee will be made about 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 after registration in September. Details of the policy on exemptions may be obtained by writing to the Admissions Officer.

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, University of Waterloo, Waterloo, Ontario.

and who may find it necessary to terminate employment before the admissions decision has been made. Appointments for interviews can be made by phone or letter to the Admissions Officer of the School of Optometry.

Note
†As is the case of other professions, graduates in Optometry must hold the certificate of the licensing body of the Province in which they elect to engage in practice.

Academic Programme
In considering applications for admission to the first professional year (Year 2), the Admissions Committee will review the high school and university transcripts to ensure a satisfactory academic background in physics, mathematics, psychology, biology and chemistry. For students at the University of Waterloo, the pre-professional Year 1 is the normal Year 1 programme of the Faculty of Science (see page 187) with Mathematics 130, Physics 111*-112* and 111L*-112L* or 121*-122* and 121L*-122L* or 121L*-122L* or 162*-163* and 162L*-163L*, Psychology 101* and Biology 132 required. Recommended options are Chemistry 121*-122* and 121L*-122L*, and Psychology 102*.

Note 1
A year of Chemistry is required for all students lacking a good Chemistry background in Ontario Grade 13 or its equivalent. For these students, Chemistry 111*-112* and 111L*-112L* is recommended rather than Chemistry 121*-122* and 121L*-122L*.

Note 2
Non-Science students intending to apply for Optometry should ensure they complete the laboratory work in their chosen Science courses.
### Year 2

#### Fall Term

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Biology 201</td>
<td>2</td>
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<tr>
<td>Chemistry 268*</td>
<td>3</td>
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<tr>
<td>Chemistry 268L*</td>
<td>0</td>
</tr>
<tr>
<td>Optometry 200*</td>
<td>2</td>
</tr>
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<td>Optometry 206*</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 224*</td>
<td>3</td>
</tr>
<tr>
<td>Psychology 283*</td>
<td>3</td>
</tr>
<tr>
<td>Anatomy, Histology and Embryology (first term)</td>
<td>3</td>
</tr>
<tr>
<td>Introductory Organic Chemistry</td>
<td>0</td>
</tr>
<tr>
<td>History and Orientation</td>
<td>0</td>
</tr>
<tr>
<td>Geometrical Optics</td>
<td>0</td>
</tr>
<tr>
<td>Anatomy of the Eye and Associated Structures</td>
<td>0</td>
</tr>
<tr>
<td>Statistical Methods in Psychology</td>
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#### Winter Term

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>Biology 201</td>
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<tr>
<td>Optometry 211*</td>
<td>3</td>
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<tr>
<td>Optometry 234*</td>
<td>3</td>
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<td>Physics 246*</td>
<td>3</td>
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<tr>
<td>Physics 246L*</td>
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</tr>
<tr>
<td>Chemistry 237*</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 237L*</td>
<td>0</td>
</tr>
<tr>
<td>Anatomy, Histology and Embryology (second term)</td>
<td>3</td>
</tr>
<tr>
<td>Physiological Optics</td>
<td>2</td>
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<tr>
<td>Anatomy of the Eye and Associated Structures</td>
<td>2</td>
</tr>
<tr>
<td>Physical Optics</td>
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<tr>
<td>Optics Laboratory</td>
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<tr>
<td>Introductory Biochemistry</td>
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### Year 3

#### Fall Term

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<tbody>
<tr>
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</tr>
<tr>
<td>Optometry 301*</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 302*</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 305*</td>
<td>3</td>
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<tr>
<td>Optometry 306*</td>
<td>3</td>
</tr>
<tr>
<td>Psychology elective*</td>
<td>3</td>
</tr>
<tr>
<td>Vertebrate Physiology (first term)</td>
<td>3</td>
</tr>
<tr>
<td>Physiological Optics</td>
<td>3</td>
</tr>
<tr>
<td>Clinical Optometry</td>
<td>3</td>
</tr>
<tr>
<td>General Pathology</td>
<td>1</td>
</tr>
<tr>
<td>Optometrical Optics</td>
<td>2</td>
</tr>
<tr>
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#### Winter Term

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Biology 301</td>
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</tr>
<tr>
<td>Optometry 311*</td>
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</tr>
<tr>
<td>Optometry 312*</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 315*</td>
<td>4</td>
</tr>
<tr>
<td>Optometry 316*</td>
<td>3</td>
</tr>
<tr>
<td>Psychology 206*</td>
<td>3</td>
</tr>
<tr>
<td>Vertebrate Physiology (second term)</td>
<td>3</td>
</tr>
<tr>
<td>Physiological Optics</td>
<td>3</td>
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<tr>
<td>Clinical Optometry</td>
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<td>General Pathology</td>
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<tr>
<td>Optometrical Optics</td>
<td>4</td>
</tr>
<tr>
<td>Perceptual Processes</td>
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### Year 4

#### Fall Term

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<td>Optometry 402*</td>
<td>3</td>
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<tr>
<td>Optometry 404*</td>
<td>2</td>
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<tr>
<td>Optometry 405*</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 406*</td>
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<td>Optometry 407*</td>
<td>2</td>
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<tr>
<td>Optometry 408*</td>
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</tr>
<tr>
<td>Optometry 409*</td>
<td>2</td>
</tr>
<tr>
<td>Physiological Optics</td>
<td>3</td>
</tr>
<tr>
<td>Clinical Optometry</td>
<td>2</td>
</tr>
<tr>
<td>Physiology of Visual Systems</td>
<td>2</td>
</tr>
<tr>
<td>Ocular Pathology</td>
<td>1</td>
</tr>
<tr>
<td>Optometrical Optics</td>
<td>4</td>
</tr>
<tr>
<td>Optometric Specialties: Contact Lenses</td>
<td>2</td>
</tr>
<tr>
<td>Optometry Clinic</td>
<td>0</td>
</tr>
<tr>
<td>Light and Illumination</td>
<td>2</td>
</tr>
</tbody>
</table>

**Note** *The curriculum which follows for Years 3, 4 and 5 may not apply for the class entering Year 2 in September, 1975.*
### Winter Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optometry 411*</td>
<td>Physiological Optics</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 412*</td>
<td>Clinical Optometry</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 414*</td>
<td>Physiology of Visual Systems</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 415*</td>
<td>Ocular Pathology</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 418*</td>
<td>Optometry Clinic</td>
<td>0</td>
</tr>
<tr>
<td>Optometry 427*</td>
<td>Optometric Specialties: Aniseikonia and Low Vision Aids</td>
<td>2</td>
</tr>
</tbody>
</table>

### Summer

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>Optometry 428</td>
<td>Summer Clinic</td>
</tr>
</tbody>
</table>

#### Note

Subject to the availability of programmes students in good standing are required to participate in vision care projects involving up to 400 hours during the period between their fourth and fifth years.

### Year 5

#### Fall Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Optometry 500*</td>
<td>Optometrical Jurisprudence and Praxis</td>
<td>2</td>
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<tr>
<td>Optometry 501*</td>
<td>Physiological Optics</td>
<td>0</td>
</tr>
<tr>
<td>Optometry 502*</td>
<td>Advanced Clinical Optometry</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 504*</td>
<td>Ocular Pharmacology</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 508*</td>
<td>Optometry Clinic</td>
<td>0</td>
</tr>
<tr>
<td>Optometry 509*</td>
<td>Community Health Optometry</td>
<td>4</td>
</tr>
<tr>
<td>Psychology 357*</td>
<td>Psychopathology</td>
<td>3</td>
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</table>

#### Winter Term

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Optometry 510*</td>
<td>Optometrical Jurisprudence and Praxis</td>
<td>2</td>
</tr>
<tr>
<td>Optometry 511*</td>
<td>Physiological Optics</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 512*</td>
<td>Advanced Clinical Optometry</td>
<td>3</td>
</tr>
<tr>
<td>Optometry 513*</td>
<td>Optometric Communication</td>
<td>2</td>
</tr>
<tr>
<td>Optometry 514*</td>
<td>Genetics for Optometrists</td>
<td>2</td>
</tr>
<tr>
<td>Optometry 518*</td>
<td>Optometry Clinic</td>
<td>0</td>
</tr>
<tr>
<td>Optometry 519*</td>
<td>Community Health Optometry</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Note

Students with a particular interest in and an aptitude for research in physiological optics may substitute Optometry 501*-511* for Psychology 357* and Optometry 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. The programme may be taken without a field of specialization (i.e. a non-major programme) or with a specified major field or study (chosen from Biology, Chemistry, Earth Sciences or Physics). 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 have the approval of a faculty advisor and, in the case of a majoring programme, must be discussed with and approved by the appropriate Department Undergraduate Officer or his delegate. Normally no more than eight term courses (or their equivalent) offered under the "Science" label at the 100-, 200- or 300-level may be applied towards any Science degree programme.

Overall Requirements
22 course-credits† total of which at least 14 should be Science Faculty course-credits normally distributed as follows:

Year 1
Common first year in Regular Science: 5 course-credits of which at least 2 are Science course-credits (for any majoring programme, the standard requirements are listed on page 187).

Year 2 and 3
6 course-credits each year of which at least 4 are Science course-credits.

Year 4
5 course-credits of which at least 4 are Science course-credits.

Note
At least 10 of the 14 Science Faculty course-credits must be at the 200-level or higher and at least 4 must be at the 300- or 400-level.

†"course-credit" denotes a full year course or its equivalent in term courses.
Year 3
6 Chemistry one-term course-credits, at least 4 of which are at the 300-level or higher.
2 other Science one-term course-credits at the 200-level or higher.
4 other one-term course-credits.

Year 4
8 Science one-term course-credits of which at least 4 must be Chemistry 300- or 400-level courses.
2 other one-term course-credits.

Note 1
Before graduation, a student must take at least one full-year equivalent course in each of the following areas of Chemistry: Analytical, Inorganic, Organic, Physical.

Note 2
Before graduation, a student must take at least one full-year equivalent laboratory (i.e. 3 hours per week for 2 terms) in each of the four areas of Note 1. Wherever possible, the laboratory chosen should accompany the appropriate course.

Honours Science (Earth Sciences major)
In total, 22 course-credits of which 10 are Earth Sciences course-credits, selected as indicated below. In addition at least four other Science course-credits and eight other course-credits must be chosen (Chemistry 121*-122* and 121L*-122L*, Physics 111*-112* or equivalent, Mathematics 130 and 122a* or equivalent must be among these choices). A suggested year by year breakdown is as follows:

(For Year 1, see page 187)

Year 2
Earth Sciences 221*, 231*, 232*, 235*, 236*, 260*
1 other Science course-credit
2 other course-credits

Year 3
3 or 4 Earth Sciences course-credits at the 300-level (chosen from Earth Sciences 331*, 332*, 333*, 336*, 342*, 345*, 360*, 370*)
At least 1 other Science course-credit
At least 1 other course-credit (for a total of 6 course-credits in Year 3)

Year 4
4 Science course-credits of which at least 2 are Earth Sciences course-credits at the 300-level shown above or from the 400-level
1 other course-credit

Honours Science (Physics major)
This programme is designed to allow a student the broadest possible selection of courses consistent with a Physics major.

Years 1 and 2 normally include the following Honours courses from Mathematics and Physics:

Physics 121*-122* and 121L*-122L* or 162*-163* and 162L*-163L*, Mathematics 130.


In Years 3 and 4, to complete this programme, the student must elect at least 9 course-credits of Physics (including the above Physics courses) of which 6 must be chosen from the 300- and 400-level courses. In the total of 22 course-credits of the programme, at least one and one-half course-credits of Physics laboratory must be included. As well as the overall 60% average, an average of 60% must be obtained in any nine Physics course-credits.
The General Science Programme

The General Science Programme is available as a three- or four-year option. Students may specialize in a particular subject area in the three-year programme or may elect to pursue a broad range of Science subjects (essentially a "non-major" programme). The three-year programme is titled "General Science" with no area of specialization designated. The four-year programme is the official majoring General Science programme. It is only available with a selected major field (Biology, Chemistry, Earth Sciences, Physics, or as a General Science and Business programme in which a broad range of specified Science courses is required, rather than a majoring area). It is officially titled "General Science, Biology Major", "General Science, Chemistry Major", etc.

Graduates of the three-year programme who have taken the required courses are qualified to apply for admission to medical school in Ontario. Students who have passed the first year of the programme with appropriate choice of courses are qualified to apply for admission to a dental school. Graduates also may be eligible for admission to the Type B course at a College of Education in Ontario or for various industrial positions such as senior laboratory technicians, technical sales representatives, and so forth.

Graduates of the four-year programme who have taken appropriate courses will be eligible for certain categories of industrial and government employment for which the three-year programme will not fit them; likewise they can meet the subject requirements for application to Type A courses at a College of Education in Ontario with specialization in a single subject.

Depending on the option chosen, a student may graduate with the General B.Sc. after either three or four years; the graduation diploma will indicate whether the three- or four-year programme has been completed. A student who has graduated from the three-year programme may apply to register for the four-year programme; upon successful completion of the latter, a new graduation diploma will be issued in exchange for the original. Students may transfer from one of these options to the other; for transfer from the three- to 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 requires the successful completion (with at least a passing mark in each) of 15 courses for the B.Sc. Normal progress is 5 courses per year. At least half of the 15 courses must be Science courses and normally no more than 7 courses are allowed from the same subject area (i.e. no more than 7 Biology courses or 7 Mathematics courses or 7 English courses, etc.). Also, at least 6 of the 15 courses must be at the 200-level or higher.

If students wish to specialize in a particular subject area in Science they are advised to follow the recommendations of Years 1-3 of the four-year programme. Alternatively, a broader selection of science subjects may be chosen but students should be warned not to make their course selection so broad and varied as to find their background of little use following graduation. The responsibility of arranging a programme selection over the three years ultimately rests with the student and he/she should ensure it meets his/her needs.

To ensure that proper advice is available and given regarding course selection, the student's programme must be approved at Registration time each year by a Faculty advisor.

Students are encouraged to take at least 4 courses (an average of better than one per year) from non-Science areas such as Arts or Mathematics.

The minimum standard for graduation from the three-year programme will be a cumulative (overall) average of 50% calculated for all courses taken (in any year – whether passed or failed).

Recommended Programme

Year 1

Any 5 courses, two of which must be Science courses. Since Year 1 is common to all subsequent programmes in Science, the student is advised to select a Year 1 programme which can lead to an area of specialization in Year 2 if desired (see page 187).

Year 2

5 courses of which 2 or 3 should normally be Science courses.

Year 3

5 courses of which 2 or 3 should normally be Science courses.

Note

Selections should be made so that at the end of Year 3 the total programme will include 15 courses (total) completed with at least half of them in Science and no more than 7 from the same subject area. In addition at least 6 of the 15 courses must be 200 or higher level courses.

Some possible electives (other than Year 1 courses described on page 203).

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 26*, 260*-261*, 266*-267*; 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. More courses are offered under the Science listing this year (e.g. Science 219*) and are especially recommended for consideration (normally no more than eight such term courses at the 100-, 200- or 300-level may be selected).

**Science courses recommended (other than Year 1 courses)**

- Biology 233, 234, 236, 245*-246*, 333, 334*, 335, 338*, 341*, 342, 343*, 344*, 345* but not 110*, 201, 235, 301, 303*-304*
- Chemistry 218*-219*, 226*-227*, 266*-267*, 316*-317*, 332*-333*, 356*-357*, 366*-367*, 395* but not 237* or 268*
- Physics 222*-223* and 222L*-223L*, 226*-227* and 226L*-227L*, 250*-251*, 301*-302*, 324*-325*, 352*-353* and 352L*-353L*, 358*-359*, 368*-369*, 380*-381*

**Mathematics courses recommended**

Mathematics 101a*, 101b*, 122a*, 130, 131a*-131b*, 132a*-132b* (if not taken in Year 1); 236, 240a*, 240b*, 243

**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 pre-requisites and timetable, a wide range of Arts courses is available.

**General Science - Four-year Majoring Programmes**

The four-year programme requires the successful completion (with at least a passing mark in each) of 20 courses for the B.Sc. Normal progress is 5 courses per year. An official major field (from Biology, Chemistry, Earth Sciences and Physics) must be selected; at least 8 courses from this major field must be completed as specified and normally not more than 10 courses from the major field area will be allowed. The only exception to the requirement of a major field is in the General Science and Business programme where a broad range of specified Science courses is required.

While considerable flexibility to take electives exists in this programme, students must take the courses required by their major Departments (there are at least 8 free electives available in each programme; Departments may have published recommendations regarding electives which should be strongly considered although they are not compulsory). Upon graduation, at least half of the 20 courses presented must be Science courses. Students are encouraged to take at least 4 courses (an average of one per year) from non-Science areas such as Arts or Mathematics.

The minimum standard for graduation from the four-year majoring programmes will be a cumulative (overall) average of 50% calculated for all courses taken (in any year – whether passed or failed) plus a 60% cumulative average for the major field courses. Students who do not maintain their major field average in the four-year programme will be transferred to the three-year (“non-major”) programme where a major field average is unnecessary.

**Recommended Programme**

The selection of courses in upper years will be restricted partly by limitations imposed by the timetable, and partly by the necessity in many courses of having completed prerequisites. Each student's programme must, therefore, be approved by the Undergraduate Officer of the Department of his major field. The following programmes are those recommended by the department for major study in their fields. The University will make every effort to ensure that the timetable accommodates these programmes.

**Biology Major**

**Year 1**

Including Biology 132 and Chemistry 121*-122* and 121L*-122L* (see page 187).

**Year 2**

Two of: Biology 233, 234, 235, 236 Chemistry 266*-267* and 267L* Two non-Biology electives.
Year 3
Two or three full courses† of: Biology 333, 334*, 335, 338*, 341*, 342, 343*, 344*, 345*
Three or two non-Biology electives (Chemistry 332*, 333* and 332L*-333L* recommended).

Year 4
Five courses at least two† of which are 400-level Biology courses or from the above list of 300-level Biology courses.

†Students wishing to apply for the Ontario Department of Education Type A certificate must choose three courses in Biology in Year 3 or take a third Biology course as an extra course. In Year 4, three Biology courses should be selected.

Note
Some possible electives are shown in the list under the three-year programme. These courses would be suitable choices here. (Physics 301*-302* is especially recommended.)

Chemistry Major
Year 1
Including Chemistry 121*-122* and 121L*-122L* and Mathematics 130 (see page 187).

Year 2
Three one-term electives† (or their equivalent).

Year 3
Four one-term electives† (or their equivalent).

Year 4
Five elective courses† per term selected to complete the requirements for the degree.

†Electives can be freely chosen provided that at least four one-term Chemistry courses at the 300- or 400-level have been taken before graduation, in addition to the required courses listed above.

Earth Science Major
Year 1
Including Earth Sciences 130 and Chemistry 121*-122* and 121L*-122L* (see page 187).

Year 2
Business Administration Option

There is a growing need for graduates who have a competence in the combined disciplines of science and business administration. For those students whose leanings are towards administration in industry, marketing, analysis, etc., rather than scientific research or teaching, the following courses are strongly recommended for inclusion in the four-year majoring programmes shown above. In some terms, six half courses are required. Because courses for this option are given by several faculties at two universities, timetable changes may occur from time to time. It is the students' responsibility to keep informed about these changes. These business and economics courses normally provide the prerequisite background for a one-year Master of Business Administration course. Admission requirements for postgraduate studies in Business Administration depend on the admitting university. In some instances, an entrance examination may be required. It is the students' responsibility to obtain information regarding admission from the university of their choice.

Year 1
Special requirement: Economics 101*-102*; Mathematics 122A* or 112A*

Year 2
Mechanical Engineering 001* or Civil Engineering 221*, Mathematics 31*, Economics 201*-202*, 191*-192*

Year 3
Business (WLU) 212*-222*, 255*-275*, Management Sciences 406*

Year 4
Economics 393*-394*, Business (WLU) 385*-395*, 388*-398*, Management Sciences 407*

General Science and Business

The following four-year General Science Programme provides a broad scientific background in many relevant areas of Science and Mathematics (without requiring a particular majoring area of Science) and is designed for the student wishing to combine the disciplines of science and business administration/economics. Students whose leanings are towards administration in industry, marketing, analysis, etc., will find it ideal for their purposes.

The programme is made up of 20 courses 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 Wilfred Laurier University and may be taken by University of Waterloo students through co-operation between the two Universities; Economics courses are offered by the Department of Economics, University of Waterloo. Because courses for this option are given by several faculties at two universities, timetable changes may occur from time to time. It is the students' responsibility to keep informed about these changes. The business and economics courses normally provide the prerequisite background for a one-year Master of Business Administration programme. Admission requirements for postgraduate studies in Business Administration depend on the admitting university. In some instances, an entrance examination may be required. It is the students' responsibility to obtain information regarding admission from the university of their choice. Some variation in the Science courses recommended will be allowed for timetable and other valid reasons, but alternate courses must be relevant to the intentions of this programme. Massive substitutions will not be allowed. Transfer into the programme will not normally be made beyond the Year 2 level.

Year 1
Physics 111*-112* General Physics
Chemistry 121*-122*, 121L*-122L* Chemical Structure; Chemical Reaction
Earth Sciences 130 Introductory Geology
Mathematics 130 Calculus
Economics 101*-102* Introduction to Microeconomics and Macroeconomics
Mathematics 122A* or 112A* Introduction to Computer Programming

Note
Physics 121*-122* or 162*-163* are acceptable alternatives to Physics 111*-112*.

Year 2
Science 219*-220* Chemistry in Modern Society; Chemistry of Pollution
or
Science 251*-252* Genetics and Evolution; Biology and Society
Chemistry 266*-267*, 267L* Organic Chemistry 1 and 2 and Laboratory
Economics 191*-192* Introduction to Financial Accounting 1 and 2
Business 212*-222* (WLU) Introduction to Marketing; Marketing Functions
Economics 201*-202* Microeconomic Theory; Macroeconomic Theory
Year 3
Science 209* Scientific Literature and Writing
Science 250* Environmental Geology
Science 351*-352* Human Biology 1 and 2
Physics 324*-325* Atomic and Nuclear Physics 1 and 2
Economics 221* Statistics for Economists
or
Business 255*-275* (WLU)
Basic Statistics; Decision Analysis
Economics elective

Year 4
Science 400 History of Science
Physics 368*-369* Geophysics 1 and 2
Business 398* (WLU) Administrative Practices
Economics 393*-394* Corporate Finance 1 and 2
Business 385*-395* (WLU) Operations Analysis and Control
Techniques; Operations Management
Business 388* (WLU) Organizational Behaviour
Summer concert in the Humanities courtyard
Undergraduate Course Descriptions

Several courses formerly offered under the designation "Arts" are now offered under "Interdisciplinary Social Science". See course descriptions in the Social Development Studies section of the Calendar. Courses designated "Arts", such as those listed below, usually cover some topics and themes of general interest to several disciplines and their presentation is often made with this interdisciplinary perspective in view. Arts courses are elective courses in General and Honours programmes and do not satisfy either the Group A or Group B requirements. Arts courses are administered through the Office of the Dean of Arts.

100 Communications
An examination of the origins, evolution and future dimensions of communications media designed to facilitate an understanding of the adequacies and inadequacies of media, to relate them to the purposes of human awareness and to explore needs and means of maintaining accountable controls over the media. The course seeks to assist students in discovering the range of informational, research and exploratory resources open to them; in gaining some preliminary experience in utilizing such sources; and in applying a critical judgment of material secured.

105* Introduction to the Sciences of Man
The course is intended to introduce the engineering, mathematics and science undergraduates to two of the sciences of man (anthropology and sociology). The course will be conducted on the basis of both lecture and tutorial hours. Lectures will be under the supervision of a single person responsible for the conduct of the course. He will have charge of inviting participants from among faculty members in the interested disciplines.
This course will not substitute for Anthropology 101*/102*; Sociology 101*.
3 hours per week
Fall and Winter

120G*/121G* Focal Issues in Contemporary Society
An attempt to bring together and condense what are believed to be essential elements of the several social science disciplines. The core of the study is a group of selected contemporary issues with implications that cut across all the various disciplines. An effort will be made to discuss values appropriate for our age. Integrating concepts are personality and culture.
Not offered 1975-76

122G*/123G* Quest for Meaning in the 20th Century
Against the background of rapidly shifting values in western culture, this course asks the student to examine his or her perspective and then face the resources of others in answering the question of Who am I? What is my obligation to society? What is my relationship to the natural world? Is there an ultimate meaning to life? Teaching methods include personal statements, thematic and biographical books and films. 3 hours per week

190*/191* Introductory Chinese
A course designed to impart a knowledge of the basic structure and grammar of modern Chinese. Emphasis will be divided equally between reading and conversation. The student will be expected to master a minimum of 500 characters. Limited to students with no prior knowledge of Chinese. Prerequisite: Permission of instructor; in addition, Arts 190* is a prerequisite for Arts 191*.

192*/193* Introductory Chinese
Similar course to Arts 190*/191* but for speakers of any Chinese dialect except Mandarin.
The course emphasizes standard pronunciation practice and analysis of Chinese literary forms. Prerequisite: Permission of instructor; in addition, Arts 192* is a prerequisite for Arts 193*.

Note
Students may not receive credit for both Arts 190*/191* and Arts 192*/193*.

200G* Issues in Mass Communication
The emphasis of the course is on the role of mass media in national and international communications and covers such topics as truth and deception, propaganda, legal controls, economic and political factors, government information systems, language and stereotypes, and mass media systems. 3 hours per week. Winter term

211*/212* 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/I. 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 prerequisite: No previous knowledge of computing is assumed. 212* presupposes 211* or permission of the instructor

215 Man in Crisis (Literary Views)
The study of representative European prose, drama, and poetry, from the writings of Dostoevsky, Nietzsche, Zamiatian, Hesse, Kafka, Brecht, Pasternak, Solzhenitsyn, Camus, Malraux, Sartre, and others. An attempt will be made to critically analyse the creative writer's artistic presentation of the ever-widening rift between environmental and "inner man", the will of the collective and non-conformity of the individual; nihilism — the result of extreme rationalization; the mystic longing for the transcendental, and other related themes. Prerequisite: Open to all students. Taught in English

218G* Love in the Western World
A historical, psychological and sociological study of love in western culture from early Christianity and subsequent waves of Romanticism to the passionless malfunctions delineated by Rollo May; and, current developments symbolized by Manson and contemporary films. Communities of love and the tensions between love and justice. 3 lectures. Fall term

219G* Dissent
A study of individuals who emerge in every society to challenge the prevailing consensus as advance agents of a new cultural outlook. Consideration will be given to Socrates, Jeremiah, Jesus, Galileo, Conrad Grebel, Marx, Wilberforce, Woodsworth, Riel, Gandhi and Martin Luther King. Through these studies the course will formulate a conception of innovation and social change.

220R* 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. Prerequisite: none
Fall term

221R* Chinese Thought and Culture 2
An investigation of the dynamics of the new China: education, medicine, the arts, the position of women, foreign policy, the Cultural Revolution, rural and urban organization, the role of the army, the role of the Chinese Communist Party, and the philosophy of Mao Tse Tung. Prerequisite: Arts 220R* or consent of instructor
Winter term
230G* 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.
Not offered 1975-76

250R Art and Society
An examination of man and society through the arts. Art as "need"; personal expression, display, celebration, communication. Themes of love and relatedness, death and illness, anxiety and despair, politics and ideology, festivity and fantasy. Art and therapy. This course will emphasize a combination of lectures and studio work.
3 hours per week. Year course
For those with little or no previous work in art

271G*/272G* Introduction to Peace Research 1 and 2
This course will focus on the current basic issues including personality and aggression, international tension, causes of war and the predicability of war, United Nations voting patterns, disarmament studies, and case studies in non-violence and peace activism.
3 lectures. Fall and Winter terms

290*/291* Intermediate Chinese
This course is designed to extend the knowledge of the structure and grammar of Mandarin Chinese beyond the base provided by Arts 190*/191*.
Prerequisite: Arts 190*/191*; in addition Arts 290* is a prerequisite for Arts 291*

292*/293* Intermediate Chinese
Description same as Arts 290*/291*.
A continuation of Arts 192*/193*.
Prerequisite: Arts 192*/193*; in addition Arts 292* is a prerequisite for Arts 293*

Note
Students may not receive credit for both Arts 290*/291* and Arts 292*/293

301G*/302G* Seminar in 20th Century Values
The purpose of this course is to help members of the University struggle with current value questions that have arisen because of the development of technology. The precise topics may vary from year to year. Examples might be the role of computers, genetic engineering, and "law and order". Resource persons from within and outside the University will provide expertise. Open to third and fourth year students.
3 lectures. Fall and Winter terms

320R*/321R* Special Topics in Chinese Thought and Culture
An indepth study of courses arising out of Arts 220R*/221R*

391*/392* Classical Chinese
A course based on selected readings from seminal works in the pre-modern literary, historical and philosophical tradition of China.
Prerequisite: Arts 190*/191*, 290*/291* or permission of instructor

393/394 Classical Chinese
Course description same as Arts 391*/392*, but for speakers of any Chinese dialect.
Prerequisite: Arts 192*/193*, 292*/293*, or permission of instructor
School of Architecture

Professor, Director

Assistant Professor, Associate Director and Undergraduate Officer
O. Dutt, B.A.(Punjab), B.Sc.(Hon.) (London), M.S. (Wisconsin), Ph.D.(Waterloo), P.Eng.

Professors
T.E. Bjornstad, B.Arch. (Iowa State), Ph.D.(Liverpool), A.I.A., M.R.A.I.C., (on Sabbatical Leave 1975-76)
L.A. Cummings, A.B.(Washington), A.M.(Missouri), Ph.D.(Washington)

Associate Professors
A. Banerji, B.Arch.(Calcutta), M.Arch.(North Dakota State)
D.R. McIntyre, B.Arch.(Toronto)

Assistant Professors
M. Elmott, Dipl. in Art and Design (High Wycombe)
K. Kuras, M. Arch. (Technical University of Warsaw)
J.C. Somfay, B.Arch.(N.S.W. Sydney), M.Arch. (Toronto)
F. Thompson, B.Arch., M.Arch.(Toronto), M.R.A.I.C.
R. Wiljer, B. A. (Waterloo), M.A.(Ottawa)
J. Zvilna

Assistant Professors (Part-time)
J. Belisle, B.Arch(McGill), M.Arch., M.L.A. (California)

Visiting Critics
A. Brown, B.Arch.(Toronto)
E. Gustavs, B.Arch., M.Arch.(Toronto)

Special Lecturers
W.G. Dailey, B.Arch.(Liverpool)
D.K. Lansdowne

Faculty members holding cross and/or joint appointments as shown
¹ Architecture and English
² Architecture, Geography, Man-Environment Studies and Urban and Regional Planning

Course Descriptions
School of Architecture

Undergraduate Course Descriptions

Courses for Bachelor of Environmental Studies
(Pre-Professional Architecture) Programme.

Recommended Core Programme, see page 137.
For Elective Course Requirements, see page 232.

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 the qualities of materials and structural behaviour; to propose alternatives in structural engineering; and to perform independent mathematical checks on simple, statically determine and indeterminate structures.

102* Mathematics
Calculus and Vector Geometry
Elementary differential and integral calculus, applications to problems involving rates of change, areas, volumes, centroids, moments of inertia; introductory vector geometry in two and three dimensions.
Prerequisite: None
4 hours per week, Fall term

103* Statistics
Descriptive statistics, sampling, curve fitting, regression and correlation; elementary queuing models, emphasis on the description of environmental processes through observational data.
Prerequisite: Arch 102* or Math 130*
3 hours lectures/labs per week. Winter term

112* & 113* Computer Science
Introduction to Programming
This course is essentially the same as Math 132. However, efforts are made to spend more time on an overview of computer systems and on solving architectural problems.
The Programming language applied is Fortran with Watfiv. A machine language simulation "Spectre" is also taught for a better understanding of the way computers operate.
Prerequisite: none
3 hours per week, Fall and Winter terms
163* Statics
Basic concepts, forces, moments, system of forces, resolution of forces, transformation of couples; resultant of force systems; centre of gravity of a system of forces and moments, of a body or mass, of composite bodies; equilibrium, free body diagrams; calculation of reactions, shears, moments, bar forces in simple trusses; friction; moment of inertia.
Prerequisite: Arch 102* or Math 130*
4 hours per week including laboratory session, Winter term

212* Computer Science Simulation
Purpose: To understand how to simulate interacting time/space event by use of computer, and to apply such simulation techniques to the solution of architectural problems.
Content: Simulation programming will be 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. will be introduced.
Prerequisite: none
3 hours per week, Fall term

213* Computer Generated Design 1
Architectural Design 1
An overview of design logic and computer system requirement currently used for architectural design.
Prerequisite: Arch 212* or consent of instructor
4 hours per week, Spring term

262* Strength of Materials
Concept of simple stress and strain; statically indeterminate axially loaded members; thermal stresses, torsion; shear and bending moments in simple beam systems; shear and moment diagrams, qualitative deflected shapes, flexural and shearing stresses, deflection calculations; combined stresses, beams of different materials, compression members, Euler's formula.
Prerequisite: Arch 163*
4 hours per week including laboratory session, Fall term

263* Theory of Structures 1
Historic review of building structures; live and dead loading, wind, snow, earthquake, reactions, stability, determinacy 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, moment diagrams by parts; influence lines, introduction to arches.
Prerequisite: Arch. 262*
4 hours per week including laboratory session, Spring term

265* Structural Morphogenesis
Exploration of new structural forms. Basic physical principles and laws governing these forms. Study of membrane surfaces. Arrangements of forms for structural efficiency, minimum surfaces and modular developments (close packing and hierarchies). Use of modular symmetry to create optimum structural systems.
Prerequisite: Architecture students should have completed first year; other students require consent of instructor
3 hours per week lecture/lab, Spring term

303* Economics
Content: The economic structure of the urban environment; the function of the enterprise system in private, public and public-private sectors and its organizational patterns of shaping the environment.
Prerequisite: none
2 hours per week

313* 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. Project oriented course, where student chosen projects with instructor approval can be processed.
Prerequisite: Arch 213*
4 hours per week, Fall or Winter term

363* 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; analysis of continuous beams having differential support settlement, of frames subjected to side-sway; analysis of pin-connected frameworks by virtual work; joint loading, thermal stresses; arches.
Prerequisite: Arch 263*
4 hours per week including laboratory session, Fall term

372* Mechanical Systems 1
Plumbing and drainage; heating, ventilating and air-conditioning systems; electrical distribution for power and light; illumination; acoustics, geometries and materials; vertical transportation systems.
Prerequisite: Arch 293*, or consent of instructor
4 hours per week including laboratory session, Winter term
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.

ES 195 Introduction to Environmental Problems
See Environmental Studies course descriptions, page 299.

ES 200 Field Ecology
See Environmental Studies course descriptions, page 299.

223 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.
Prerequisite: ES 195*
2 hours per week, Spring term

224* An Introduction to Landscape Design
An introduction to the design of landscape with emphasis upon the architectural attributes of plant and land forms.
Prerequisite: Arch 192 and 193
3 hours (1 hour lecture, 2 hours studio), Fall, Winter and Spring terms

ES 252* Media Tools for Environmental Studies
See Environmental Studies course descriptions, page 299.

ES 253* Media Tools for Environmental Studies—Advanced Level
See Environmental Studies course descriptions, page 299.

ES 358* Environmental Pollution and its Control
See Environmental Studies course descriptions, page 300.

ES 380*/381* Environmental Studies Workshop
See Environmental Studies course descriptions, page 300.

ES 400 Environmental Law
See Environmental Studies course descriptions, page 300.
194* Visual Interdisciplinary Language
Theory and practice of visual form based on formative processes and hierarchical structures. Propositions: form follows process, rotation is a universal form-generating process, symmetric form is a result of an asymmetric process and freedom is the single organizing principle.
Prerequisite: Consent of instructor
2 hours per week, Winter term

252* Creative Problem Solving
Development of creative skills through group behavior 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.
Prerequisite: Consent of instructors
One 40 hour week, Winter term

284*, 285* Architectural Research
This offers a student an opportunity for independent research study into architectural problems not offered in the regular curriculum, guided exploration of specific architectural problem areas, of appropriate complexity to the particular term.
Prerequisite: Approval of (in house) Undergraduate Affairs Committee
Equivalent of 3 hours per week, Fall and Winter terms

292 Design Concepts and Studio
To develop in each student the ability to design on a small, personal scale and explore design as a thinking process. Small space design exercises where the student is required to define and analyze a problem and generate an architectural solution. Solutions are refined through a series of evaluations. The finalized solution is presented and construction documents produced.
Prerequisite: Arch 193
14 hours per week including lectures and workshops, Fall term
1½ course credits

293 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.
Prerequisite: Arch 292
14 hours per week including lectures and workshops, Spring term
1½ course credits

384*, 385* Architectural Research
This offers a student an opportunity for independent research study into architectural problems not offered in the regular curriculum. It allows guided exploration of specific architectural problem area, of appropriate complexity to the particular term.
Prerequisite: Approval of (in house) Undergraduate Affairs Committee
Equivalent of 3 hours per week, Fall and Winter terms

392 Design Concepts and Studio
Design of complex environments; the effect of legal and administrative controls on the design process and form; the influence of mechanical, structural and industrial building components on design process and architectural form. Projects will involve coordination of the design task with other disciplines involved in such projects.
Prerequisite: Arch 293
21 Hours per week including lectures and workshops, Winter term
2 course credits

393 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.
Prerequisite: Arch. 392
21 hours per week including lectures and workshop, Fall term
2 course credits
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.

142* 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.
Prerequisite: None
4 hours per week including laboratory session,
Fall term

143* Iconography 2
A survey of the symbolic Nature of the Environment
A study centered on ancient life to initiate the student into the stream of cultural history and the complex problems of what the artist is, the quality of human existence, culture, environment, as well as the working of the icon from raw state of perceived image to its function as an expressive symbol in poetry, music, dance, architecture and other works of art; a study of modern work in comparison to ancient achievement.
Prerequisite: Arch. 142*
4 hours per week including laboratory session,
Fall term

244* History of Gardens of Europe and Western Asia
To study the garden as a work of art reconciling man with his world and to examine gardens of Europe, Western Asia, Ancient Greece, the Roman Empire and the countries of Islam and mediaeval Europe, as specific responses of the age and the climate and landscape of the country in which they were formed.
Prerequisite: Arch. 142*, 143*, and 246* for architecture students and completion of first year for others
Two hours lectures in first half of the course and three hours discussions in second half of the course,
Fall term

245* 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.
Prerequisite: Students who have completed first year
Two hours lectures and one hour tutorial per week, Winter and Spring terms—depending on faculty resources available

246* 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.
Prerequisite: Arch. 143*
4 hours per week including laboratory session
Fall term

247* Renaissance to Revolution
Sense of Periods and Styles
Analysis of the various styles emerging out of provincial and international Gothic, especially Italian use of classical models, the spread of this "renaissance" mode, leading to consideration of the Mannerist, the Baroque, the Rococo, the Neoclassical; investigation of the course of men's attitudes from humanism, nationalism, and Reformation through the Enlightenment until the French Revolution and Hume's dethronement of Reason.
Prerequisite: Arch. 246*
4 hours per week including laboratory session
Spring term

346* Romanticism and 20th Century
Sense of Periods and Styles
Depiction of "modern" culture as one in which the notion of environmental order as the fulfilling of natural law is replaced by a notion of order as the creation of the autonomous human will through a study of selected works in philosophy, literature, art and architecture.
Prerequisite: Arch 247* or consent of instructor
4 hours per week including laboratory session
Winter term
347* 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 the beginnings of science.
Prerequisite: Arch. 346* or consent of instructors
4 hours per week including laboratory session
Fall term

Courses for Bachelor of Architecture

Recommended Core Programme, see page 137.
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 evolution, alone and with the aid of others; to communicate skilfully, verbally and graphically, the solutions to 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.

423* Urban Planning
Introduction to urban theory to understand the forces of obsolescence and change and to analyze critically and define patterns of interaction in the urban scene, the changing ecological structure of the city and consideration of the technological, economic and social forces accounting for these changes; ecological and location theories; accelerated urbanization; large scale urban systems.
Prerequisite: none
2 hours per week, Fall term

452* 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.
Prerequisite: B.E.S. standing
2 hours per week, Spring term

455* 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.
Prerequisite: B.E.S. standing
3 hours per week, Fall term

462* 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.
Prerequisite: B.E.S. standing
4 hours per week including laboratory session
Spring term

463* Structural Synthesis 2
Concrete and Timber Designs
Design and behaviour of structural concrete systems, application of building specifications; analysis and design of concrete elements using ultimate strength principle; criteria for choosing structural concrete systems; introduction to prestressed concrete. Behaviour and design of modern wood structures; fasteners, ring connectors and their significance in timber construction; proportioning and design of sawn and laminated timber members.
Prerequisite: Arch. 462*
4 hours per week including laboratory session
Spring term

472* Mechanical Systems 2
Heating, ventilating and air conditioning systems for buildings; plumbing and drainage; electrical distribution for power and light in buildings; illumination; acoustics, geometrics and materials; and vertical transportation systems.
Prerequisite: Arch. 372*
4 hours per week including laboratory session
Spring term
Course Descriptions
School of Architecture

484*/485* Architectural Research
This offers a student an opportunity for independent research study into architectural problems not offered in the regular curriculum. It allows guided exploration of specific architectural problem area, of appropriate complexity to the particular term.
Prerequisite: Approval of (in house) Undergrad. Affairs Committee
Equivalent of 3 hours per week, Spring and Fall terms

492, 493 Design Studio
The intent of these courses is to develop skills and gain experience in architectural design through the application of design and analysis techniques to complex building types. This is approached through a series of design projects aimed at the exploration of generative factors in the definition of built form. Projects are closely related to existing contexts and parallel current practicing conditions. Both individual and group work are included.
Prerequisites: B.E.S. or its equivalent
21 hours per week in both 492 and 493, Spring and Fall terms
492 - 2 course credits
493 - 2 course credits

554* 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.
Prerequisite: Arch. 455*
3 hours per week, Fall term

555* 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.
Prerequisites: B.E.S. standing
2 hours per week, Winter term

563* 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 antielastic surfaces. Cable-stayed systems; analysis of space structures; space frames and roof systems; one and two-way design.
Prerequisite: 4B architecture standing or equivalent
3 hours per week, Winter term

584*/585* Architectural Research
This offers a student an opportunity for independent research study into architectural problems not offered in the regular curriculum. It allows guided exploration of specific architectural problem area, of appropriate complexity to the particular term.
Prerequisite: Approval of (in house) Undergrad. Affairs Committee
Equivalent of 3 hours per week, Fall and Winter terms

592, 593 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 innovate level. Thus considerable emphasis is placed on formulation of policy and development of design solutions from the knowledge gained during the research period.
Prerequisite: 492 and 493
32 hours per week in both 592 and 593, Winter and Spring terms
592 - 3 course credits
593 - 3 course credits

Electives
Students are permitted to study courses given by the University at large which are in the area of the student’s individual interest. This will hopefully provide better orientation and more inter-disciplinary communications relevant to the student’s academic pursuits.

Electives are divided into the following two categories:

(TE)
Theme Elective (B.E.S. Degree) courses within the Faculty of Environmental Studies which deal with ecological issues. Theme Elective (B.Arch. Degree) any course within the School of Urban and Regional Planning.

Each student pursuing a B.E.S. 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 B.Arch. degree must have one half course credit in the theme area of Planning by or before his/her 10th academic term.
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.
Department of Biology

Professor, Chairman of Department
J.K. Morton, B.Sc., Ph.D.(Durham), F.L.S.

Professor, Graduate Officer
A.D. Harrison, M.Sc., Ph.D.(Capetown)

Assistant Professor, Graduate Officer
S.M. Smith, M.Sc.(McMaster), Ph.D.(Manitoba)

Associate Professor, Undergraduate Officer
H.R.N. Eydt, M.Sc., Ph.D.(McMaster)

Assistant Professor, Undergraduate Officer
W.R. Hawthorn, M.Sc.(McMaster), Ph.D.(Western)

Associate Professor, Associate Chairman of Department
J.E. Thompson, B.S.A.(Toronto), Ph.D.(Alberta)

Professors
C.H. Fernando, B.Sc.(Ceylon), D.Phil.(Oxford), F.R.S.E.
H.B.N. Hynes, Ph.D., D.Sc.(London), A.R.C.S.
W.B. Kendrick, B.Sc., Ph.D.(Liverpool)
G. Power, B.Sc.(Durham), Ph.D.(McGill)

Adjoint Professor
P.S. Corbett, B.Sc.(Reading), Ph.D.(Cambridge), D.Sc.(Reading), F.I. Biol.

Associate Professors
C.R. Barnes, B.Sc.(Birmingham), Ph.D.(Ottawa)
A.M. Charles, M.Sc., Ph.D.(Manitoba)
E.B. Dumbroff, M.Forestry, Ph.D.(Georgia)
H.C. Duthie, B.Sc., Ph.D.(Wales)
W.E. Inniss, M.S.A.(Toronto), Ph.D.(Michigan State)
A.G. Kempton, M.S.A.(Toronto), Ph.D.(Michigan State)
J. Kruuv, M.Sc.(Waterloo), Ph.D.(Western)
P.E. Morrison, M.Sc.(Western), Ph.D.(McMaster)
G.G. Mulamoottil, B.Sc.(Mysore), M.Sc.(Bombay), Ph.D.(Delhi)
J.J. Pasternak, M.A.(Toronto), Ph.D.(Indiana)

Assistant Professors
R.D. Beauchamp, B.A.(McMaster), M.A., Ph.D.(Brown)
J.C. Carlson, M.Sc., Ph.D.(Massachusetts)
J.J. Dodson, B.Sc.(Waterloo), Ph.D.(McGill)
R.G.H. Downer, M.Sc.(Queen's University, Belfast), Ph.D.(Western)

H.W. Elmore, B.Sc.(Western Kentucky), Ph.D.(Vanderbilt)
M. Globus, M.Sc.(McGill), Ph.D.(Toronto)
D.E. Hart, M.Sc.(Western), Ph.D.(Carleton)
C.I. Mayfield, B.Sc., Ph.D.(Liverpool)
J.C. Semple, B.Sc.(Tulsa), M.A., Ph.D.(Washington University, St. Louis)
J.B. Theberge, B.Sc.A.(Guelph), M.Sc.(Toronto), Ph.D.(U.B.C.)

Faculty members holding cross appointments as shown
1 Biology and Earth Sciences
2 Biology and Physics
3 Biology and Urban and Regional Planning
4 Biology and Optometry

Undergraduate Course Descriptions

All Honours Biology students who have completed their third year are required to participate in an off-campus field course before entering Year 4. These courses are held either in April (following examinations but before the end of term) or the following September (after Labour Day). The cost will be approximately $100 per student.

The Huntsman Marine Laboratory, St. Andrews, New Brunswick offers a summer course "Introduction to Marine Biology". This course will be accepted as 0.50 transfer course credit towards a B.Sc. if taken by students of the University of Waterloo.

Note

The 110th Introductory Zoology
An introduction to the principles of zoology. The course will include a survey of cell structure and function, animal growth and development, genetics, and ecological concepts, with emphasis placed on the role of man in the biosphere.

2 lectures, 3 hours laboratory, Winter term
(Primarily for students of Kinesiology. Available also to students in Faculties other than Science)

131 Introduction to Biology
The principles of biology are developed by reference to all biology (including genetics), growth and development, and to selected organisms. Man is discussed as a biological organism.

2 lectures, 3 hours laboratory
(For all students other than those intending to major in Biology or to enter the School of Optometry)
132 Principles of Biology
An introductory course designed to give a grounding in the main branches of biology. Emphasis is laid on an understanding of biological processes and on relating these to the structure and diversity of living organisms.
2 lectures, 3 hours laboratory
(For Science students intending to major in Biology or to enter the School of Optometry)

201 Anatomy, Histology and Embryology
A survey of functional mammalian anatomy and histology, with particular emphasis on the human, and an introduction to basic embryology.
Prerequisite: Biology 132 or equivalent
2 lectures, 3 hours laboratory
(For Optometry students only)

233 Vertebrate Zoology
The evolution of vertebrate body as exemplified by both living and fossil members of the group. Laboratory dissections form an integral part of the course.
Prerequisites: Biology 131 or 132
2 lectures, 3 hours laboratory

234 Plant Biology
A survey of the major groups of plants, including their evolution, morphology, ecology and importance to man.
Prerequisites: Biology 131 or 132
2 lectures, 3 hours laboratory

235 Fundamentals of Microbiology
Introduction to fundamental theories, principles and methods of microbiology. Structure, systematics, growth and metabolism of microorganisms. Outline of the major groups of microorganisms. Discussion of their role in natural habitats, industrial processes and disease.
Prerequisites: Biology 131 or 132
2 lectures, 3 hours laboratory
(Only for Honours Biology and 4-year Biology majors and Regular Honours Chemistry students)

236 Ecology 1
An introduction to the study of the relationship of plants and animals to their environment. The nature of ecosystems, energy flow, biogeochemical cycling, concepts of habitat and ecological niche. Introduction to population and community ecology. Physiological ecology, environmental factor interaction. Plant and animal biogeography, the major ecosystems of Canada.
Prerequisites: Biology 131 or 132
2 lectures and 1 tutorial, plus field trips as required

245* General Microbiology 1
History and scope of microbiology. Study of the characteristics of bacteria and other microorganisms.
2 lectures, 3 hours laboratory, Fall term
(Not available to students who are Honours Biology or 4-year Biology majors)

246* General Microbiology 2
Relationships of microorganisms to man and his environment.
Prerequisite: Biology 245*
2 lectures, 3 hours laboratory, Winter term
(Not available to students who are Honours Biology or 4-year Biology majors)

301 Vertebrate Physiology
The physiology of the major organ systems of the vertebrate body, with emphasis on the human. The topics discussed include circulation, respiration, digestion and nutrition, metabolism, muscle, nervous system, special senses, and the endocrine system.
Prerequisite: Biology 131 or 132
2 lectures, 3 hours laboratory
(For Optometry students only)

303* Vertebrate Physiology
An integrated study of basic physiological phenomena with particular emphasis placed on the cardiovascular and respiratory systems. Other topics which will be discussed include digestion, excretion and endocrinology.
Prerequisite: Biology 110* or 131 or 132
2 lectures, 3 hours laboratory, Fall term
(Primarily for students of Kinesiology. Available also to students in faculties other than Science)

304* Vertebrate Physiology
A detailed study of physiological processes associated with nerve and muscle function, and consideration of the integrative role of the central nervous system.
Prerequisite: Biology 110* or 131 or 132
2 lectures, 3 hours laboratory, Winter term
(Primarily for students of Kinesiology. Available also to students in faculties other than Science)

333 Invertebrate Zoology
A survey of the major invertebrate phyla with emphasis on the anatomy, taxonomy, and ecology of selected representatives.
Prerequisite: Biology 110*, 131 or 132
2 lectures, 3 hours laboratory
334* The Flowering Plants
(Students entering this course are required to make a plant collection during the long vacation prior to the course.)
2 lectures, 3 hours laboratory, Fall term

335 Microbial Form and Function
The effects of cultural conditions on the morphology and molecular architecture of microorganisms. Other topics to be discussed will include the interactions of structure and function and the biology and genetics of bacterial viruses.
Prerequisite: Biology 235 or permission of instructor
2 lectures, 3 hours laboratory

338* Plant Morphology and Morphogenesis
Plant structure in relation to function and development with particular reference to the vascular plants. Cell, tissue and organ differentiation.
Prerequisite: Biology 234
2 lectures, 3 hours laboratory, Winter term

341* Cell Physiology
The functional organization of cells with particular reference to cell-cell interaction, the structure, function and development of organelles and the biological roles of cellular membranes.
Prerequisites: Biology 131 or 132
2 lectures, 3 hours laboratory, Fall term
(Available only to students who are also taking Chemistry 332*-333*)

342 Vertebrate Physiology
A study of the physiology of vertebrate organ systems and their integration, with emphasis placed upon the effects of current developments on basic physiological concepts.
Prerequisites: Biology 233 or 243*-244*
2 lectures, 3 hours laboratory
(Available only to students who are also taking Chemistry 332*-333*)

343* Histology and Cytology
The structure of mammalian cells, tissues and organs interpreted in functional terms. Cell reproduction and differentiation, with some discussion of the embryological origin of tissues and the regulation of tissue growth. Light and electron microscopy techniques.
Prerequisites: Biology 131 or 132
2 lectures, 3 hours laboratory, Winter term

344* Cytogenetics
Chromosomes as the physical basis of heredity. Chromosomal mechanisms in mitosis and meiosis. The origin, inheritance and adaptive significance of aberrations and changes in number. Variant chromosomal systems.
Prerequisites: Biology 131 or 132
2 lectures, 3 hours laboratory, Fall term

345* Plant Physiology
An integrated study of plant function: the dynamics of nutrient and water movement, photosynthesis, control mechanisms of growth and development.
Prerequisite: Biology 234
2 lectures, 3 hours laboratory, Winter term
(Available only to students who are also taking Chemistry 332*-333*)

431 Ecology 2
Quantitative and dynamic ecology. The species and the individual in the ecosystem. Population and community ecology; competition and predation, population regulation, community metabolism and productivity. Plant synecology; vegetation and ecosystem classification, the analysis and description of plant communities. Experimental ecology. Introduction to systems ecology; the development of models, analysis of model properties.
Prerequisite: Biology 236
2 lectures and 1 tutorial

432 Microbial Ecology
Roles of microorganisms in natural and special environments, with emphasis on the methods for studying the nature and functions of microbial populations.
Prerequisite: Biology 235
2 lectures, 3 hours laboratory

433 Entomology
An introduction to the classification, functional anatomy and physiology of insects.
(Students entering this course are required to make an insect collection preferably during the long vacation prior to the course.)
2 lectures, 3 hours laboratory

434 Genetics
A survey of genetics with emphasis on bacterial and bacteriophage genetics and the molecular basis of gene action.
2 lectures, 3 hours laboratory
435 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.
Prerequisite: Biology 235, Chemistry 332*-333* or 337
2 lectures, 3 hours laboratory

437* Biosystematics
A study of living organisms in relation to evolutionary processes and classification.
Prerequisite: Biology 344*
3 hour lecture-seminar, Fall term

441 Plant Physiology
A detailed study of the physical and chemical processes that govern plant growth and function.
Prerequisite: Biology 345*
2 lectures, 3 hours laboratory

442 Comparative Animal Physiology
A comparative study of physiological processes in the animal kingdom and their relation to environmental microbiology.
Prerequisite: Biology 342
2 lectures, 3 hours laboratory

443 Applied Microbiology
Properties of pathogenic microorganisms and special groups related to food and fermentation microbiology.
Prerequisite: Biology 335
2 lectures, 3 hours laboratory

444* Evolution
Prerequisite: Biology 131 or 132
3 hours lecture-seminar, Winter term

445* Mycology
Selected topics in fungal systematics and ecology. A survey of economic and medical mycology.
Prerequisite Biology 234
2 lectures, 3 hours laboratory, Fall term

446* Phycology
A study of selected topics in the biology of algae.
Prerequisite: Biology 234
2 lectures, 3 hours laboratory, Winter term

447* 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.
No prerequisites
3 lectures, Winter term
(Not to be taken in conjunction with Science 400)

448 Development 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.
Prerequisite: Biology 343* is strongly recommended as preparation for this course
2 lectures, 3 hours laboratory

449 Immunology and Virology
The course will consist of an introduction to the nature of antigens and antibodies and their reactions, hypersensitivity and blood groups, as well as a study of the nature and interactions of animal, insect bacteria and plant viruses and their hosts.
Prerequisite: Biology 235
2 lectures, 3 hours laboratory

450 Limnology and Oceanography
A survey course covering the important physical, chemical and biological aspects of fresh and marine waters and including such topics as circulation of nutrients, eutrophication, aquatic food chains and productivity.
Prerequisites: Biology 236 and 333
3 lectures

499 Seniors 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 70% average in their major field(s) will be accepted into this course.
Canadian Studies

The Programme
The Departments of Economics, English, French, Geography, History, Political Science and Sociology co-operate in the offering of a special programme in Canadian Studies designed to provide the student with an interdisciplinary approach to the study of all aspects of Canada.

Students who propose to concentrate in Canadian Studies (see the outline of the programme on p. 87 of the Calendar) complete a standard first year programme (in which French 190 is required, or French 101*/102* if the equivalent of Year 5 French has not been passed) and then follow the Honours programme of one of the above departments, or a double Honours programme with two of the above departments.

In each of Years 2, 3, and 4 the student takes the equivalent of three full courses (four if double Honours) in his major department(s), one of which (or one each if double Honours) is the department’s principal Canadian course at that level. In each year electives are chosen from among the various Canadian content courses offered by each participating department (as listed below).

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.

The student is granted, upon successful completion of the 22-course programme, an Honours B.A. in his major subject with the subtitle of Canadian Studies.

Core Courses

201* Canadian Studies
An interdisciplinary course offered both through lectures and discussion groups devoted to the Canadian social and physical environments. The course works from the assumption that regional identities are varied and complex in Canada, and that an understanding of this complexity is essential in the process of dealing with Canadian problems.

202+ Canadian Studies
Also an interdisciplinary approach to the study of the cultural environment in Canada. Canadian culture is examined within a regional context.

300 Canadian Studies
A seminar course, staffed by at least two faculty members from different departments, in which particular themes and problems relating to Canada will be investigated. The content of the programme each year will vary according to the interest and inclination of faculty and students.

Prerequisite: Canadian Studies 201*/202* or permission of the instructors

400 Canadian Studies
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.

Prerequisite: Canadian Studies 300

Principal Canadian Content Courses
Offered by the Participating Departments

Economics
101* Introduction to Microeconomics
102* Introduction to Macroeconomics
241* Cost-Benefit Analysis and Project Evaluation
263* Economic History of Canada
341* Public Finance
343* Urban Economics
347* Industrial Organization
351* Labour Economics
353* Population Economics
355* Economics of Energy and National Resources
363* Contemporary Canadian Problems
364* Contemporary Canadian Problems

English
205R* The Canadian Short Story
208F* Themes in Canadian Literature
313* Canadian Literature to 1920
314* Canadian Poetry Since 1920
315* Canadian Prose Since 1920
316* Canadian Drama
415* Major Canadian Writers
495* Senior Honours Essay in Canadian Literature
Course Descriptions
Canadian Studies

French
190 French Language, or French 151*/152* if students have not passed the equivalent of Year 5 French
131* Basic French
132* Basic French
191* French Language
192* French Language
205* Spoken French
206* Spoken French
250 Intensive Language Training
271* Poetry and Song in Québec
272* Introduction to French-Canadian Novel
273* Aspects of Québec
300 Advanced Instruction in Written French
375* Contemporary French-Canadian Novel
376* The “essai” in French Canada
401* Advanced Language Study
402* Advanced Language Study
471* French-Canadian Poetry
472* Contemporary Québec Theatre
501* Problems of French Language
502* Problems of French Language

Geography
195* Environmental Studies:
Introduction to Environmental Problems
322* Geographical Study of Canada
341* Historical Geography of Canada 1
342* Historical Geography of Canada 2
411* Resource Studies
422* Canada

History
123 Major Themes in Canadian History
222* Modern French Canada
224* Canadian History Since 1867
225* Canadian Culture and Society
265 Canadian History
266 The History of Selected Racial and Regional Minorities
267* Canadian Non-Indigenous Minorities 1
268* Canadian Non-Indigenous Minorities 2
275* Comparative Studies in Canadian Regionalism to 1850
276* Comparative Studies in Canadian Regionalism after 1850
379 Pre-Confederation Canada 1760-1867
380 Canada 1867-1967
382 Canadian Intellectual History
383 History of French Canada in 1867
384 Canada in Crisis
386* Ontario History to Confederation
387* Ontario History Since Confederation
388* History of Canadian/American Relations
389 Canada in World Affairs: The Twentieth Century
390 History of North American Indians

420 Senior Seminar in Nineteenth-Century Canadian History
421 Senior Seminar in Ontario History
423 Senior Seminar in Modern Québec
425 Senior Seminar in Canadian Cultural History
450 Marxism and Canadian History

Political Science
102* Introduction to Politics 2
232* Policy Making in Canada
260* Canadian Government and Politics
291* The Canadian Legal Process
292* Aspects of Canadian Law
331* Public Administration 1
332* Public Administration 2
341* Provincial Politics
343* Urban Politics 1
373* Political Parties
374* Interest Group Politics
377* Political Socialization
431* Canadian Public Policy 1
432* Canadian Public Policy 2
434* Canadian Foreign Policy
442* Politics in Ontario
443* Politics in Western Canada
444* The Politics in Québec
445* Politics in the Atlantic Provinces
451* Comparative Parliamentary Systems
461* Problems in Canadian Politics 1
462* Problems in Canadian Politics 2
473* Voting Behaviour
478* Research Seminar in Political Socialization

Sociology
101* Introduction to Sociology
120R Fundamentals of Sociology
205* Social Problems
215* Sociology of Sex Roles
250* Crime and Society
251* Ethnic and Racial Relations
262* Canadian Population
300* Canadian Social Institutions
301* Urban Sociology
315* Social Stratification
320R Canadian Ethnic and Cultural Minorities
321* Research Methods 1
323* Project in Sociological Research
399* Research Seminar in Canadian Society
499 Honours Essay
Principal Canadian Content Courses Offered by Other Arts Departments

**Anthropology**
- 233* Eskimo Cultures
- 234* North American Indians'
- 235* Contemporary Canadian Indian Scene
- 310* People of the North American Subarctic

**Fine Arts**
- 316* Canadian Art
- 317* Canadian Art

**Inter-Disciplinary Social Science**
- 210R Community Issues

**Philosophy**
- 225* Problems in Social and Political Philosophy in Canada
- 312* Philosophy of Education 2

**Psychology**
- 242* Educational Psychology: Learning Disabilities
- 454* Senior Seminar in Educational Psychology

**Religious Studies**
- 3391 Theologians of Renewal
- 264P* Religion in Canada 1
- 265P* Religion in Canada 2

**Social Work**
- 120R* Introduction to Social Work
- 125R* Social Problems
Course Descriptions
Chemical Engineering

Department of Chemical Engineering

Professor, Chairman of Department
K.F. O'Driscoll, B.Ch.E.(Pratt Inst.), M.A., Ph.D. (Princeton)

Professor, Associate Chairman (Graduate Studies)
E. Rhodes, B.Sc., Tech., M.Sc., Ph.D.(Manchester)

Associate Professor, Associate Chairman
(Graduate Studies)

Professors
T.L. Butke', B.A.Sc., Ph.D.(Toronto)
F.A.L. Dullien, Dipl. Ing.(Budapest Technical University), M.A.Sc., Ph.D. (U.B.C.)
T.Z. Fahidy, B.Sc., M.Sc.,(Queen's), Ph.D.(Illinois)
R.Y-M. Huang, B.Sc.,(National Taiwan University) M.A.Sc., Ph.D.(Toronto)
M. Moo Young, B.Sc.,(London), M.A.Sc.(Toronto), Ph.D.(London)
D.C.T. Pei, B.Eng.(McGill), M.Sc.(Queen's), Ph.D. (McGill)
P.M. Reilly, U.E., B.A.Sc.(Toronto), D.I.C., Ph.D. (London), F.S.S.
D.S. Scott, B.Sc., M.Sc.(Alberta), Ph.D.(Illinois)
P.L. Silveston, B.S., M.S.(M.I.T.), Dr. Ing.(Munich)
D.R. Spink, B.S.(Mich.), M.S.(Rochester), Ph.D. (Iowa State)
G.A. Turner, B.Sc.,(London), Ph.D.(Manchester)
B.M.E. van der Hoff, Ing.(Amsterdam), Ir.(Delft)

Professor Emeritus
A.H. Heatley, B.Sc., M.A., Ph.D.(Toronto)

Assistant Professors
I.F. Macdonald, B.Eng.(N.S.T.C.), Ph.D.(Wisconsin)
G.S. Mueller, B.A.Sc.,(Waterloo), M.Sc., Ph.D. (Manchester)

J.M. Scharer, B.Sc., Ph.D.(Pennsylvania)

Faculty members having cross-appointments as shown
1 Chemical Engineering and Philosophy

Undergraduate Course Descriptions

The number of lectures, laboratories and/or tutorials associated with each course is given in the earlier section of the calendar, on the general description of the Chemical Engineering Undergraduate Programme.

100 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. Consideration is given to the non-technical and social implications of the engineer's work. Laboratory on visual communication is included.
3 hours lectures, one hour tutorial, 6 hours lab. for first 6 weeks only, Fall term

101 Introductory Engineering Concepts 2
An extension of the topics covered in Ch.E. 100: energy balances; unsteady-state behaviour of engineering systems. Laboratory experiments illustrate the physical principles discussed.
3 hours lectures, 1 hour tutorial, 3 hours laboratories, Winter, Spring terms

102 Chemistry for Engineers
An extension of chemical principles to applications of importance 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.
3 lectures. 1 tutorial Fall term

211 Transport Processes 1 (Fluid Mechanics)
Fundamental physical concepts 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 particular systems.
3 hours lectures, 3 hours laboratories, Spring, Fall terms
220 Applied Mathematics 1
3 hours lectures, Fall, Winter terms

220 Applied Mathematics 2
Advanced functions: gamma-, beta-, and error-functions; sine-, cosine-, exponential - and elliptic-integrals. Linear differential equations; Wronskian and Green function; initial and boundary value problems; Bessel functions; Fourier series, integrals and transforms; orthogonal functions; Laplace transforms; application to ODE and PDE in chemical engineering; numerical solution.
Prerequisite: Ch.E. 220
3 hours lectures, Winter, Spring terms

230 Physical Chemistry 1
Introduction to Physical Chemistry. Ideal and real gases, the kinetics 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.
3 hours lectures, 1 hour tutorial, Fall, Winter terms

231 Physical Chemistry 2
Prerequisites: Ch.E. 230
3 hours lectures, 1 hour tutorial, Spring, Fall terms

232 Inorganic Chemistry 1
3 hours lectures, Fall, Winter terms

233 Physical-Chemical Laboratory
A laboratory to demonstrate common physico-chemical principles and techniques of physical measurements. Training in technical report writing is included. Experiments on viscosity of gases and liquids, chemical kinetics, adsorption, homogeneous and heterogeneous catalysis, thermochemistry, phase equilibria, diffusion, determination of molecular weight of polymers.
3 hours laboratories, Spring, Fall terms

312 Transport Processes 2 (Heat Transfer)
Introduction to heat transfer. Momentum-heat transfer analogies and dimensional analysis. Steady and transient heat conduction, convection and applications to engineering problems. Radiant heat transfer and heat transfer with change of phase.
Prerequisite: Ch.E. 221
3 hours lectures, 1 hour tutorial, Winter, Spring terms

313 Transport Processes 3 (Mass Transfer)
Mass transfer by molecular (diffusion) and convective action. The application of mass transfer concepts to the design and analysis of both stage-wise and continuous separation processes such as: distillation, extraction, absorption and others. Analogies and interrelationships between momentum, energy and mass transport phenomena.
Prerequisite: Ch.E. 312
3 hours lectures, 2 hours tutorials, Fall, Winter terms

315 Chemical Engineering Laboratory
Experimental application of physical and chemical principles using pilot scale equipments. Representative experiments illustrating major unit operations (distillation, absorption, extraction, drying, humidification) are available.
Prerequisite: Ch.E. 312
6 hours laboratories, Fall, Winter terms

320 Applied Mathematics 3
Advanced functions: gamma-, beta-, and error-functions; sine-, cosine-, exponential - and elliptic-integrals. Linear differential equations; Wronskian and Green function; initial and boundary value problems; Bessel functions; Fourier series, integrals and transforms; orthogonal functions; Laplace transforms; application to ODE and PDE in chemical engineering; numerical solution.
Prerequisite: Ch.E. 220
3 hours lectures, Winter, Spring terms

330 Chemical Engineering Thermodynamics
Prerequisite: Ch.E. 231
3 hours lectures, Winter, Spring terms

331 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 of homogeneous reactors. Elements of heterogeneous catalysis: mass transfer effects; catalytic rate equations. Simplified analysis and design of fixed and fluidized bed reactors.
Prerequisite: Ch.E. 231
3 hours lectures, Fall, Winter terms
332 Inorganic Chemistry 2
Prerequisite: Ch.E. 232
3 hours lectures, Winter, Spring terms

334 Instrumental Methods of Chemical Analysis
An introduction to modern analysis including optical, electrochemical, radiochemical, chromatographic and spectroscopic methods.
3 hours laboratories, Winter, Spring terms

420 Process Dynamics and Control 1
Block and signal flow diagrams, proportional-integral-derivating controllers, frequency response techniques, analytical and graphical stability criteria. Introduction to modern control theory.
Prerequisites: Math 31, Ch.E. 312
3 hours lectures, Spring, Fall terms

422 Engineering Economics
Mathematics of annuities, mortgages, bonds and small loans. Cost accounting, including direct costing, depreciation, taxes and financial statements. Estimation of sales and capital and operating costs of a new process or product. Study of criteria for the appraisal of capital expenditures. Introduction to the Critical Path Method Introduction to Linear Programming.
3 hours lectures, Spring, Fall terms

482 Technical Seminar and Process Design
Study and presentation of material in recent literature, or from industrial experience. Technical seminars will be presented and criticized. Subject material will be from recent literature or industrial experience. The other half of the course will include lectures in equipment on the sizing and costing, as well as problems on the design of process components.
3 hours lectures, Spring, Fall terms

501 The Chemical Engineer as an Entrepreneur
An introduction to the mechanism by which an individual engineer may develop a new small business for the purpose of supplying goods or services to the Canadian chemical or resource processing industries, while performing most of the technical and management functions himself, with the occasional help of professional specialists. Technical, economic, legal and financial aspects will be outlined.

510 Physical-Chemical Properties of Gases and Liquids
The most up-to-date methods available for the estimation of the more important physico-chemical properties of gases, and liquids in cases where experimental values are not to be found. Prediction is usually based on correlations of a form suggested in part by theory, with empirical constants based on experimental data.
3 hours lectures, Winter term

511 Selected Topics in Process Applications
Chemical Engineering fundamentals in process applications such as pipeline flow, fluidized bed reactors, pneumatic reactors, two-phase system, drying, multiple-component distillation, and other unit processes.
3 hours lectures, Spring term

513 Non-Newtonian Flow and Heat Transfer
Qualitatively unique characteristics of non-newtonian fluids. Experimental techniques for measurement of material properties. Molecular and continuum stress-shear rate theories. Some simple stress-shear rate theories in problems of fluid flow and heat transfer.
3 hours lectures, Winter term

520 Chemical Engineering Analysis
Application of advanced mathematical techniques to the analysis of chemical engineering processes. 
Prerequisite: Permission of instructor
3 hours lectures, Fall, Winter terms

521 Process Dynamics and Control 2
Analog computation, time domain analysis, control complex chemical systems.
Prerequisite: Ch.E. 420
3 hours lectures, Winter term

523 Process Control Laboratory
Experiments on process dynamics and control and analog simulation of chemical processes. Time constant, step and frequency response, controller settings, and cascade control of thermal, liquid level, and reaction systems.
Prerequisite: Ch.E. 420
4 hours laboratories, Winter term

540 Introduction to Polymer Science
Basic concepts of polymer chemistry, classification of polymers, introductory physical polymers, organic chemistry of polymerization reactions of polymers, naturally occurring polymers.
3 hours lectures, Spring, Fall terms
541 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.
Prerequisite: Ch.E. 540
3 hours lectures, Winter term

543 Polymer Laboratory
Experimental studies of polymerization and physical properties of polymers: condensation and addition polymerization, copolymerization, molecular weight, extrusion rheology, etc.
Co-requisite: Ch.E. 541
3 hours laboratories, Winter term

550 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.
3 hours lectures, Spring, Fall terms

551 Metallurgical Chemistry
3 hours lectures, Winter term

553 Principles of High Temperature Extractive Metallurgy
Study of the underlying principles of several metallurgical processes of importance in Canada. Kinetics and mechanisms of roasting and reduction reactions, industrial roasting, blast furnace and electric furnace reduction; nature of melts and slags, slag metal reactions; converting, refining and fused salt electrolysis: Review of current research.
3 hours lectures, Winter term

560 Introduction to Biochemical Engineering
Aspects of the biological sciences, primarily microbiology and biochemistry, of interest to the biological process industries (fermentation and food products) and to environmental pollution (air and water). Classification and growth characteristics of microorganisms. Physico-chemical properties of biological compounds. Metabolism and biochemical kinetics.
3 hours lectures, some laboratories, Spring, Fall terms

561 Fermentation Operations
Methods of solving engineering problems imposed by physical and biological factors in fermentation systems. The unifying principles of the processing operations involved in the production of antibiotics, yeast, enzymes, beverage alcohol and other microbial products, and in biological waste treatment. Specialized mass transfer, heat transfer, mixing and rheology applications.
Prerequisite: Ch.E. 560 or permission of instructor
3 hours lectures, some laboratories, Winter term

563 Food Processing
Methods of solving engineering problems imposed by physicochemical constraints in biological systems encountered in food processing. Formulation, processing, preservation and quality evaluation of natural and textured foods, food components and additives: mixing, extrusion, sterilization, separation, purification and concentration operations.
Prerequisite: Ch.E. 560 or permission of instructor
3 hours lectures, some laboratories, Winter term

570 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, social-political, economic and engineering concepts of air pollution control. The course will be project oriented.
3 hours lectures, Spring Fall terms

571 Physico-chemical Methods in Water Pollution Control
Physical/chemical treatment of waste water from metals processing and finishing industries; characterization of wastes; toxicity of wastes; recycle of wastes; treatment by electro-oxidation/reduction, ion exchange, solvent extraction, adsorption, electrodialysis, reverse osmosis etc.; economics, regulations, moral, legal, social and political implications.
3 hours lectures, Winter term

580 Research-Design Project 1
An individually supervised research and/or design project on any Chemical Engineering subject chosen by the student-professor group.
6 hours laboratories, Spring, Fall terms

581 Research-Design Project 2
Continuation of Ch.E. 580.
Equivalent to two one-term courses
12 hours laboratories, Winter term
583 Process System Design
The undergraduate curriculum is co-ordinated and brought together to accomplish by team effort the basic objective of the process engineer, the design of an integrated process.
4 hours laboratories, 2 hour tutorials, Winter term

585 Technical Elective Project
An individually supervised research or design project, based on one of the technical elective courses taken in the 4A term.

007, 280, 281, 380, 381, 480, 481, - General Awareness Seminar
Informal discussions on the Chemical Engineering Programmes. Descriptions of elective, option and research patterns available within the department, as well as those in other departments and faculties. Professional ethics and the social implications of Chemical Engineering; career opportunities. Seminars by Alumni speakers.
Non-credit
Department of Chemistry

Professor, Chairman of Department
W.A.E. McBryde, M.A.(Toronto), Ph.D.(Virginia),
F.C.I.C.

Professor, Dean of the Faculty of Science
W.B. Pearson, D.F.C., M.A., D.Sc.(Oxon), F.R.S.C.,
F.C.I.C.

Professor, Associate Dean of the Faculty of Science
(1971-74)
R.G. Woolford, M.Sc.(Western), Ph.D.(Illinois),
F.C.I.C.

Associate Professor, Associate Dean of the Faculty of Science
(as of July 1, 1975)
D.A. Brisbin, B.Sc.(Alberta), Ph.D.(Toronto)

Professor, Acting Director of the Guelph-Waterloo
Centre for Graduate Work in Chemistry
G. Scoles, Dottore in Chimica(Genova), Lib.Doc.
(Genova)

Professors
D.E. Irish, B.Sc.(Western), M.Sc.(McMaster), Ph.D.
(Chicago), F.C.I.C.
F.W. Karasek, B.S.(Elmhurst), Ph.D.(Oregon State),
F.C.I.C.
H.G. McLeod, M.A., Ph.D.(Toronto)
J.B. Moffat, B.A., Ph.D.(Toronto), F.C.I.C.
L.W. Reeves, B.Sc., Ph.D., D.Sc.(Bristol), F.C.I.C.
A. Rudin, B.Sc.(Alberta), Ph.D.(Northwestern)
H.D. Sharma, M.Sc.(Delhi), Ph.D.(California)
J.G. Smith, B.A., M.A., Ph.D.(Toronto)
T. Viswanatha, M.Sc., Ph.D.(Mysore)

Adjunct Professor
R.H.F. Manske, M.Sc.(Queen's), Ph.D., D.Sc.
(Manchester), D.Sc.(McMaster), F.R.S.C., F.C.I.C.

Associate Professors
G.F. Atkinson, M.A., Ph.D.(Toronto), F.R.I.C.
J.B. Capindale, M.A., D.Phil.(Oxford)
A.J. Carty, B.Sc., Ph.D.(Nottingham)
J. Cizek, R.N.Dr.(Charles University, Prague), C.Sc.
(Czecho-Slovak Academy of Sciences, Prague)
W.L. Elsdon, M.Sc.(Western), Ph.D.(McGill)
B.O. Fraser-Reid, M.Sc.(Queen's), Ph.D.(Alberta)
T.E. Gough, B.Sc., Ph.D.(Leicester)
J.L. Koppel, B.A., Ph.D.(Toronto)
D. Mackay, B.Sc., Ph.D.(Aberdeen)
A.D. Maynes, M.A., Ph.D.(Toronto)
R.R. McCourt, B.Sc., Ph.D.(British Columbia)
J. Faldus, R.N.Dr.(Charles University, Prague),
C.Sc.(Czecho-Slovak Academy of Sciences, Prague)
V.A. Snieckus, B.Sc.(Alberta), M.S.(California),
Ph.D.(Oregon)

Course Descriptions
Chemistry

G.E. Toogood, B.Sc., Ph.D.(Nottingham)

Assistant Professors
L.J. Brubacher, B.A.(Goshen College, Indiana),
Ph.D.(Northwestern)
P.C. Chieh, B.Sc.(Nat Taiwan), M.Sc.(Nat. Tsing
Hua), Ph.D.(British Columbia)
R.J. Friesen, B.Sc., M.Sc.(Manitoba)
R.J. LeRoy, B.Sc., M.Sc.(Toronto), Ph.D.(Wisconsin)
M. Tchir, B.Sc.(Alberta), Ph.D.(Western)

Senior Demonstrators
M. Barwell, B.Sc.(Brock), M.Sc.(Waterloo)
W.J. Byars, H.N.C.(Dundee Technical College),
B.Sc.(Waterloo)
M.C. Michael (Miss), B.Sc.(Waterloo)
M. Vatcher, H.N.C.(Bolton Technical College)

Faculty members holding cross appointments as shown
Chemistry and Physics
Chemistry and Applied Mathematics
Chemistry and Chemical Engineering

Undergraduate Course Descriptions

Details of the undergraduate programmes offered by the Faculty of Science are to be found in Chapter 15. 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.

001* Pre-University Chemistry
The course covers the material considered essential preparation for first year chemistry courses. Included are formulae, nomenclature, stoichiometry, and an introduction to thermochemistry, solution chemistry, chemical equilibria, acids, bases and oxidation reduction reactions, kinetics and bonding. Successful completion of this course fulfills the University Admission requirements where high school Chemistry is necessary. Offered by correspondence only, one term.
No University credit

11* General Chemistry
Stoichiometry, properties of gases, liquids and solutions, gas phase chemical equilibria, ionic equilibria in aqueous solutions, oxidation-reduction, chemical kinetics.
3 lectures, 1 tutorial, Fall term
(For students registered in the Year 1 Engineering programme.)
26* 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.
3 lectures, 3 hours laboratory, alternate weeks, Fall and Winter terms
(Normally for students in Year 2 Engineering)

36* Organic Chemistry 2
An introduction to the important classes of heterocyclic compounds and natural products.
Prerequisite: Chemistry 26*
3 lectures, Fall and Spring terms
(Normally for students in Year 2 Engineering.)

111* General Chemistry 1
Structure and properties of matter, formulae, nomenclature, stoichiometry, atomic and molecular structure.
Prerequisite: Grade 12 Chemistry
3 lectures, Fall term
Science students must take Chemistry 111L* with this course.

111L* General Chemistry 1 Laboratory
Selected experiments for students taking Chemistry 111*.
3 hours laboratory, 0.25 course credit, Fall term

112* General Chemistry 2
Chemistry 111* continued to include chemical equilibria and rates of reaction and oxidation reduction reactions.
Prerequisite: Chemistry 111*
3 lectures, Winter term
Science students must take Chemistry 112L* with this course.

112L* General Chemistry 2 Laboratory
Selected experiments for students taking Chemistry 112*.
3 hours laboratory, 0.25 course credit, Winter term

121* Chemical Structure
Stoichiometry and structure; periodic atomic properties and their chemical implications; descriptive chemistry of selected compounds; special interest topics.
Prerequisite: Years Chemistry, Mathematics (Functions and Relations; and Calculus)
3 lectures, Fall term
Science students must take Chemistry 121L* with this course

121L* Chemical Structure Laboratory
Selected experiments for students taking Chemistry 121*.
3 hours laboratory, 0.25 course credit, Fall term

122* Chemical Reaction
Ionic equilibria in aqueous solutions; oxidation-reduction; reaction kinetics and mechanisms in aqueous solutions; special interest topics.
Prerequisite: Chemistry 121*
3 lectures, Winter and Spring terms
Science students must take Chemistry 122L* with this course.

212* Structure and Bonding
Ionic and valence bond models; molecular orbital theory; bond lengths and bond energies; hydrogen bond and other weak interactions; properties, structures and stereochemistries of typical inorganic compounds; acid-base behaviour; nomenclature.
(Primarily for Honours students majoring in Chemistry.)
Prerequisite: Chemistry 121*
2 lectures, Fall and Winter terms

218* Development of Chemical Bonding and Structure
Prerequisite: Chemistry 121*
2 lectures, 1 tutorial, Fall term

219* 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.
Prerequisite: Chemistry 218*
2 lectures, 1 tutorial, Winter term
220* Introductory Analytical Chemistry
The principles underlying quantitative measurements.
(Primarily for Honours students majoring in Chemistry.)
Prerequisite: Chemistry 121*-122*
2 lectures, Fall and Winter terms

220L* Analytical Chemistry Laboratory 1
Selected experiments for students taking Chemistry 220*.
6 hours, 0.5 course credit, Fall and Winter

221* Analytical Chemistry of Multi-Component Systems
Applications of electroanalytical methods, spectroscopic methods, and analytical separations to the quantitative description of multi-component systems.
(Primarily for Honours students majoring in Chemistry.)
Prerequisite: Chemistry 220*
2 lectures, Fall, Winter and Spring terms

221L* Analytical Chemistry Laboratory 2
Selected experiments for students taking Chemistry 221*.
3 hours, 0.25 course credit, Fall, Winter and Spring terms

224 Chemical Spectroscopy
An introductory survey of the principles and applications of spectroscopic techniques used in the modern chemical laboratory. Topics will include electronic, vibrational and rotational spectroscopy, and magnetic resonance spectroscopy.
Prerequisites: A first year Chemistry course, e.g. Chemistry 121*-122* and a knowledge of Calculus, e.g. Mathematics 130
2 lectures per week, 2 terms (full-year course)

226* Chemical Analysis 1
A variety of classical and modern analytical methods.
Prerequisites: Chemistry 121*-122*
2 lectures, Fall term

226L* Chemical Analysis 1 Laboratory
Basic techniques of analytical methods.
3 hours, 0.25 course credit, Fall term

227* Chemical Analysis 2
The evolution of some modern analytical methods.
Prerequisite: Chemistry 226* or 220*
2 lectures, Winter term

227L* Chemical Analysis 2 Laboratory
The application of analytical methods to contemporary problems in Chemistry and other Sciences.
6 hours, 0.5 course credit, Winter term

231 Chemical Bonding, Structure and Main Group Chemistry
Modern concepts of chemical bonding and their application to the inorganic chemistry of the Main Group elements emphasizing the Periodic Table and the interrelationships between structure, bonding and reactivity.
Prerequisite: A first year Chemistry course, e.g. Chemistry 121*-122*
2 lectures, for two terms (full-year course)

237* Introductory Biochemistry
The basic chemistry of amino acids, peptides, proteins, carbohydrates and lipids including some aspects of metabolism.
Prerequisite: Chemistry 268*
3 lectures, Winter term
(For Optometry students only.)

237L* Introductory Biochemistry Laboratory
Selected experiments for students taking Chemistry 237*.
3 hours, 0.25 course credit, Winter term

254* Physical Chemistry 1
Kinetic theory of gases and elementary transport properties. Thermodynamics of ideal systems. Rate of chemical reactions and applications to the elucidation of reaction mechanisms.
Prerequisites: Chemistry 121*-122*, Mathematics 130
2 lectures, 1 tutorial, Fall and Winter terms

255* Physical Chemistry 2
Introductory quantum mechanics. Phase equilibria, phase rule, and the properties of liquids and solutions.
Prerequisites: Chemistry 254*, Mathematics 31*
2 lectures, 1 tutorial, Fall, Winter and Spring terms

260* Organic Chemistry 1
A course identical to Chemistry 264* for correspondence students.

261* Organic Chemistry 2
A course identical to Chemistry 364* for correspondence students.
264* Organic Chemistry 1
Preparation and reactions of typical organic functional groups examined from the basis of the reaction mechanisms. Introduction to spectroscopic correlations of these functional groups. Stereochemistry of organic molecules. (Primarily for Honours students majoring in Chemistry.)
Prerequisites: Chemistry 121*-122*
2 lectures, 1 tutorial, Fall, Winter and Spring terms

264L* Organic Chemistry Laboratory 1
Selected experiments for students taking Chemistry 264*.
3 hours, 0.25 course credit, Fall, Winter and Spring terms

266* Organic Chemistry 1
The properties, preparation, reactions and basic structural theory of the common classes of aliphatic compounds. Introduction of electrophilic and nucleophilic reaction mechanisms.
Prerequisite: Chemistry 121* and 122*
2 lectures, 1 tutorial, Fall term

267* Organic Chemistry 2
The properties, preparation, reactions and basic structural theory of the common classes of aromatic compounds. A continuation of organic reaction mechanisms. Introduction to the chemistry of carbohydrates, proteins, steroids, etc.
Prerequisite: Chemistry 266*
2 lectures, Winter term

267L* Organic Chemistry Laboratory
Selected experiments for students taking Chemistry 267*.
3 hours 0.25 course credit, Winter term
(For students needing a full year of Organic Chemistry as a prerequisite to medicine, the sequence 266*-267* and 267L* should be selected; for Honours students majoring in Chemistry, 264*-364* plus the appropriate laboratory courses 264L*-364L* should be selected.)

268* Introductory Organic Chemistry
The basic chemistry of the important classes of aliphatic and aromatic compounds including aspects of stereochemistry and reaction mechanisms.
Prerequisite: Ontario Year 5 Chemistry or equivalent is required; first year University Chemistry desirable.
3 lectures, Fall term
(For Optometry students only.)

268L* Introductory Organic Chemistry Laboratory
Selected experiments for students taking Chemistry 268*.
3 hours, 0.25 course credit, Fall term

Note
Most 300-level honours courses are listed as 2 hours lectures; an additional 1 hour tutorial may be scheduled at the discretion of the instructor.

311* Radiochemistry
Prerequisite: Chemistry 121* or equivalent
2 lectures, offered in Winter term

312* Transition Element Chemistry
The transition elements and their compounds. Stereoch of complex ions; ligand field and molecular orbital theories of metal-ligand bonding; electronic spectra and magnetoochemistry of complexes; reaction mechanisms.
Prerequisite: Chemistry 212*
2 lectures, offered in Fall and Spring terms

313* The Chemistry of the Main Group Elements
A systematic approach to the synthesis, properties, reactions and structures of main group element compounds. Trends in chemical behaviour, bonding and stereochemistry. Electron deficient compounds, the rare gases, chemistry of phosphorus, nitrogen and sulphur will be dealt with in detail.
Prerequisite: Chemistry 212*
2 hours, Winter term

314L* Inorganic Chemistry Laboratory 1
An introduction to practical inorganic chemistry.
3 hours, 0.25 course credit, offered in Fall, Winter and Spring terms

315L* Inorganic Chemistry Laboratory 2
Advanced experiments in inorganic chemistry.
Prerequisite: Chemistry 314L*
6 hours, 0.5 course credit, offered in Fall and Winter terms

316* 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.
Prerequisite: Chemistry 218* or 212*
2 lectures, Fall term
316L* Inorganic Chemistry Laboratory
Selected experiments for students taking Chemistry 316*. 
3 hours, 0.25 course credit, Fall term

320* 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. 
Prerequisites: Chemistry 221* or 227*
2 lectures, Winter term

320L* Chemical Instrumentation Laboratory
Selected experiments for students taking Chemistry 320*.
3 hours, 0.25 course credit, Winter term

332* Biochemistry 1
Prerequisites: Chemistry 264* or 267*
2 lectures, offered in Fall and Spring terms

332L* Biochemistry 1 Laboratory
Qualitative and quantitative measurements of biologically important materials for students taking Chemistry 332*.
3 hours, 0.25 course credit, offered in Fall and Spring terms

333* Biochemistry 2
Introduction to the chemistry and metabolism of carbohydrates and lipids. 
Prerequisite: Chemistry 332*
2 lectures, Winter term

333L* Biochemistry 2 Laboratory
A continuation of Chemistry 332L* for students taking Chemistry 333*.
3 hours, 0.25 course credit, Winter term

337 Biochemistry
Carbohydrates, lipids, proteins, hormones, nucleic acids, and vitamins. Metabolism of these groups of compounds. Physico-chemical aspects of biochemistry. 
Prerequisites: Chemistry 264*, 264* or 266*, 267* or equivalent
2 lectures, two terms (full-year course for correspondence students, equivalent to 332*-333*)

342* Quantum Chemistry
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. 
Prerequisite: Chemistry 255*
2 lectures, Fall term

344 Inorganic and Nuclear Chemistry
Survey of transition metal chemistry including ligand field theory of coordination compounds and an introduction to organometallic chemistry. Introduction to nuclear and radiochemistry. 
Prerequisites: a background in Chemical Bonding, e.g. Chemistry 212* or 218* or 231
2 lectures, for two terms (full-year course)

350* Spectroscopy and Molecular Structure
Introduction to concepts and applications of microwave, Raman, IR, electronic and resonance spectroscopy with respect to molecular parameters. 
Prerequisite: Chemistry 255*
2 lectures, Winter term

351* 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. 
Prerequisite: Chemistry 355*
2 lectures, Fall term

353* Introduction to Polymer Science
Basic definitions and polymer nomenclature, molecular weight averages and distributions, polymer constitution, configuration and conformation, step-growth and free-radical chain-growth polymerization and copolymerization. 
Prerequisite: Chemistry 255*
2 lectures, offered in Fall and Spring terms

354* Applied Kinetics
Introduction to kinetics and mechanism of elementary chemical processes in homogeneous systems, reversible, consecutive and simultaneous reactions, interpretation of kinetic data. Application to industrial processes, both batch and continuous. 
Prerequisite: Chemistry 255*
2 lectures, offered in Fall and Spring terms

355* Physical Chemistry 3
Elementary statistical mechanics. Introduction to the physical chemistry of surfaces and simple macromolecules. 
Prerequisites: Chemistry 255* and Mathematics 31*
2 lectures, offered in Fall, Winter and Spring terms
355L* Physical Chemistry Laboratory 1
Selected experiments for students taking Chemistry 355*.
3 hours, 0.25 course credit, offered in Fall, Winter and Spring terms.

356* 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.
Prerequisite: Chemistry 122* and Math 130
2 lectures, Fall term

356L* General Physical Chemical Laboratory 1
Selected experiments for students taking Chemistry 356*.
3 hours, 0.25 course credit, Fall term. (A special section in Winter term will be available for Honours Biology and Chemistry students only.)

357* General Physical Chemistry
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.
Prerequisite: Chemistry 356*
2 lectures, Winter term

357L* General Physical Chemistry Laboratory 2
Selected experiments for students taking Chemistry 357*.
3 hours, 0.25 course credit, Winter term

358* Physical Chemistry 4
Some theories of rates of chemical reactions. Basic electrochemistry and transport properties of ionic solutions. Application of quantum mechanics to atomic spectroscopy.
Prerequisite: Chemistry 355*
2 lectures, offered in the Fall and Winter terms

358L* Physical Chemistry Laboratory 2
Selected experiments for students taking Chemistry 358*.
6 hours, 0.5 course credit, offered in Fall and Winter terms

359* Application of Chemical Thermodynamics
Partial molal quantities; Gibbs chemical potential and non-ideal systems; chemical equilibrium; theory of electrolytes.
Prerequisite: Chemistry 255*
2 lectures, Winter term

360* Organic Chemistry 3
Stereochemistry of organic compounds; conformational isomers, geometrical (cis-trans) isomers, optical isomers and diastereomers. Introductory carbohydrate chemistry.
Prerequisite: Chemistry 261*
2 lectures, Fall term

361* Organic Chemistry 4
Acidity and basicity of organic compounds. Formation and reactions of enolate anions with emphasis on their synthetic utility. Cycloaddition reactions.
Prerequisite: Chemistry 360* or 261* or 364*
2 lectures, Winter term

362* Theoretical Organic Chemistry
A number of topics in physical and organic chemistry treated from a semi-empirical consideration of molecular structure.
Prerequisites: Chemistry 364*, Math 31* or equivalent
2 lectures, Winter term

363* Applied Organic Chemistry
The organic chemistry involved in selected industrial processes will be discussed. Petroleum chemistry, synthesis of dyestuffs, pharmaceuticals, pesticides, organic polymers, etc.
Prerequisite: Chemistry 364* or 267*
2 lectures, Fall term

364* Organic Chemistry 2
The treatment of organic chemistry in Chemistry 264* is continued and extended to aromatic compounds. (Primarily for Honours students majoring in Chemistry.)
Prerequisite: Chemistry 264*
2 lectures, 1 tutorial, offered in Fall, Winter and Spring terms

364L* Organic Chemistry Laboratory 2
Selected experiments for students taking Chemistry 364*.
6 hours, 0.5 course credit, offered in Fall, Winter and Spring terms

365* Organic Chemistry 3
Stereochemistry and conformational analysis of organic molecules. Acidity and basicity. Formation and reactions of enolate anions with emphasis on their synthetic utility.
Prerequisite: Chemistry 364* or 267*
2 lectures, offered in Fall and Winter terms

Course Descriptions
Chemistry
366* Structural and Synthetic Organic Chemistry
Stereochemistry of organic molecules; synthesis of selected organic compounds examined in detail with emphasis on cyclo-addition reactions and condensation reactions.
Prerequisites: Chemistry 267* or 364*
2 lectures, Fall term

366L* Organic Chemistry Laboratory
Selected experiments for students taking Chemistry 366*.
3 hours, 0.25 course credit, Fall term

367* Selected Topics in Organic Chemistry
Some of the following topics will be discussed: natural products, photochemistry, organometallic compounds, carbohydrates.
Prerequisite: Chemistry 365* or 366*
2 lectures, Winter term

395* 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.
2 lectures, Winter term

409* 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.
Prerequisite: Chemistry 212*
2 lectures, Fall term

411* Organometallic Chemistry
Prerequisite: Chemistry 312*
2 lectures, Fall term

416* 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.
Prerequisites: Chemistry 312*
2 lectures, Fall term

417* 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.
Prerequisite: Chemistry 312* or 313*
2 lectures, Winter term

419* 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.
Prerequisite: Chemistry 312* or 316*
2 lectures, Winter term

420* 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.
Prerequisite: Chemistry 221* or 227*
2 lectures, Fall term

432* Biochemistry 3
Kinetics, stereospecificity, structure and function of enzymes, bio-energetics, oxidative phosphoroylation.
Prerequisite: Chemistry 333*
2 lectures, Fall term

432L* Biochemistry 3 Laboratory
Selected experiments for Honours Biology and Chemistry students taking Chemistry 432*.
3 hours, 0.25 course credit, Fall term

443* Biochemistry 4
Chemistry and biosynthesis of porphyrins. Metabolism of amino acids, purines and pyrimidines. Role of vitamins in biological transformations. Respiration, muscular contraction.
Prerequisite: Chemistry 432*
2 lectures, Winter term

443L* Biochemistry 4 Laboratory
Selected experiments for Honours Biology and Chemistry students taking Chemistry 443*.
3 hours, 0.25 course credit, Winter term
434* Applied Biochemistry
Chemistry and function of antibiotics; blood coagulation and related topics. Immuno-chemistry. Nutritional aspects of food.
Prerequisite: Chemistry 333*
2 lectures, Winter term

437 Biochemistry 2
Selected topics and techniques in modern biochemistry; energy transfer, transport across membranes, comparative aspects of metabolism, mechanism and kinetics of enzyme activity, structural macromolecules.
Prerequisite: Chemistry 337
2 lectures
(Full year course for correspondence students, equivalent to 432*—433*)

440* Group Theory
Basic group theory, irreducible representations, molecular symmetry groups, character tables, reduction of representations. These various concepts will be illustrated by application to specific examples.
Prerequisite: Mathematics 31*
2 lectures, Fall term

453* Polymer Properties and Polymerization
Polymerization reactions; control of polymer structure and properties.
Prerequisite: Chemistry 353* or equivalent
2 lectures, Fall term

454* 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.
Prerequisite: Chemistry 255*
2 lectures, Fall term

455* Electrochemistry
Electrolytic conductance and transport, thermodynamics of electrolytic cells. Reversible and irreversible electrode processes, metallic corrosion; study of selected industrial electrochemical processes.
Prerequisites: Chemistry 255* or 356*
2 lectures, Fall term

456* 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.
Prerequisite: Chemistry 255*
2 lectures, Winter term

457* Experimental Aspects of Polymer Science
Selected experiments to describe properties of polymers and polymerization processes.
Prerequisite: Chemistry 353* or equivalent 1 lecture, 3 hours laboratory, Winter term

458* Quantum Chemistry
The application of quantum mechanics to chemistry with emphasis on the investigation, correlation, and elucidation of chemical bonds and reactions.
Prerequisite: Chemistry 358*
2 lectures, Winter term

464* Spectroscopy in Organic Chemistry
Elucidation and identification of organic structures by contemporary spectroscopic techniques.
Prerequisites: Chemistry 364*, 350*
2 lectures, Fall term

465* Special Topics in Organic Chemistry
One of the following topic areas will be discussed in a given term: molecular rearrangements, photochemistry, organometallics, heterocyclic compounds, natural products, carbohydrates, principles of organic synthesis. An honours student may elect this course in both third and fourth year provided different topic areas are covered; in such a case, credit will be given as 465A and 465B.
Prerequisite or corequisite: Chemistry 365*
2 lectures, Winter term

492 Advanced Laboratory
9 hours laboratory.
Fall and Winter terms (a full-year course)
Department of Civil Engineering

Professor, Chairman of the Department
T.H. Topper, B.A.Sc.(Toronto), Ph.D.(Cambridge)

Professor, Dean of Engineering
W.A. McLaughlin, B.Eng.(Saskatchewan), M.S., Ph.D.(Purdue)

Associate Professor, Associate Chairman of Graduate Studies
W.C. Lennox, B.A.Sc., M.Sc.(Waterloo), Ph.D. (Lehigh)

Professor, Associate Chairman of Undergraduate Studies
R.C.G. Haas, B.Sc., M.Sc.(Alberta), Ph.D.(Waterloo)

Professor, Associate Dean of Engineering, Graduate Studies
H.H.E. Leipholz, Dipl.Eng., Dr.Ing., Docent Habil (Stuttgart)

Professors
S.T. Ariaratnam, B.Sc.(Eng.) (Ceylon), M.Sc. (London), Ph.D.(Cambridge)
M.Z. Cohn, C.Sc(Bucharest)
G.M.L. Gladwell, B.Sc., Ph.D., D.Sc.(London)
V.K. Handa, B.Sc.(Calcutta), B.Sc.(Eng.) (London), M.Sc.(Queen's), M.A.Sc., Ph.D (Waterloo)
B.G. Hutchinson, B.E.(Sydney), M.Sc.(Queen's), Ph.D.(Waterloo)
N.C. Lind, M.Sc.(Tech. Univ. of Denmark), Ph.D. (Illinois)
J.T. Pindera, Dr. of Tech. Sciences(Warsaw), Docent Habl(Cracow)
T. Prasad, B.Sc., M.Sc.(Banaras Hindu Univ.), Ph.D.(Cambridge)
M.G. Cohn, C.Sc.(Bucharest)
J. Roorda, B.A.Sc.(Waterloo), Ph.D.(London)
J. Schroeder, B.Eng., M.Eng.,(McMaster), Ph.D. (Waterloo)
A.N. Sherbourne, B.Sc.(London), M.S.(Lehigh), M.A. Ph.D.(Cambridge), D.Sc.(London)
T.E. Unny, B.E.(Madras), M.Tech.(Karaipur), Dr. Ing.(Dresden)

Associate Professors
E.F.P. Burnett, B.Sc.(Cape-town), D.I.C., M.S., Ph.D. (London)
R.W. Cockfield, B.Sc., M.Sc.(Queen's), Ph.D. (Waterloo)
G.J. Farquhar, B.A.Sc., M.A.Sc.(Waterloo), Ph.D. (Wisconsin)
R. Green, B.Sc.(Eng.) (London), M.Sc.(Queen's), M.Sc.(Waterloo), Ph.D.(Texas)
D.E. Grierson, B.A.Sc., M.A.Sc., Ph.D(Waterloo)
B. LeLievre, B.Eng.(West Australia), M.A.Sc., Ph.D. (Waterloo)
E.L. Matyas, B.A.Sc.(Toronto), D.I.C., Ph.D.(London)
G.M. McNeice, B.A.Sc.(Waterloo), Ph.D.(London)
J. Shortreed, B.Eng.Sc.(Western), M.Sc.(Queen's), Ph.D.(Northwestern)
K.N. Smith, B.A.Sc.(Toronto), M.S.(Illinois), Ph.D. (Waterloo)
O.L. White, B.Sc.(Melbourne), M.A.Sc.(Toronto), Ph.D.(Illinois)

Assistant Professors
N. Kouwen, B.A.Sc., Ph.D.(Waterloo)
J.C. Thompson, B.A.Sc.(Toronto), M.S., Ph.D. (Illinois)
S. Yagar, B.A.Sc., M.A.Sc.(Toronto), Ph.D.(California)

Research Assistant Professor
J.F. Martin, B.S.(Marquette), M.S., Ph.D.(Illinois)

Adjunct Professors
P. Allen
D.G. Havard, B.Sc.(London), M.A.Sc., Ph.D. (Waterloo)
N.W. McLeod, B.Sc.(Alberta), M.Sc.(Saskatchewan), Ph.D.(Michigan)
J.J. Munk, B.Sc.(Sir George Williams), B.Eng. (McGill), LL.B.(Osgood Hall)
O. Stradal, C.E., D.Sc.(Prague)

Undergraduate Course Descriptions

110 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. Travel demand forecasting procedures. Role of demand information in resolving issues. Transport planning options: traffic restraint and road pricing; transport technology and potential in ameliorating issues; general development options. Not intended for civil engineering students at any level

200 Civil Engineering Project 1
Preliminary designs of standard civil engineering structures. The creation and evaluation of alternative locational and spatial configurations in accordance with user socio-economic and technological requirements. Informational content of previous courses is augmented with case studies of typical civil engineering problems and solutions.
203 Statics
An analytic treatment of static equilibrium of particles and rigid and deformable bodies. Internal forces in straight beams and columns, diagrams of axial force, shear force and bending moment.

204 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.

205 Mechanics of Deformable Solids 1
Introduction of the concepts of stress and strain. Stress-strain relations for linearly elastic and other materials; analysis of the response of prismatic members to axial, shearing, flexural or torsional loads.

206 Mechanics of Deformable Solids 2
An extension of CE205. Combined stress and strain states, Mohr's circle yield and failure criteria, energy methods, virtual work buckling of columns, and an introduction to simple statically indeterminate structures.

221 Calculus
A continuation of Math 12. Infinite series and power series, partial derivatives, multiple integration with applications, vector analysis, theorems of Green and Gauss, line integrals and Fourier analysis.

222 Differential Equations

224 Probability and Statistics
A course in aspects of probability and statistics. Sample spaces, calculus of events, probability, conditional probability, independence, permutations and combinations, random variables, discrete and continuous distributions, mean and variance, Chebychev's inequality, joint distributions, random sampling, the normal distribution, law of large numbers, central limit theorem, parameter and interval estimation, hypothesis testing, regression, analysis of variance.

265 Structure and Properties of Materials
Structure of Materials — Topics include: crystalline and non-crystalline arrangements, bonding forces, structural defects, phase equilibria, non-equilibrium transformations, heat treatment of metals, deformation resistance; elasticity, anelasticity, plasticity and creep, fracture properties; brittle and ductile fracture, fatigue, embrittlement fractures, mechanical properties of plain concrete and polymers.

280 Fluid Mechanics
An introductory course in fluid mechanics. Unit and dimension, fluid statics, fundamentals of fluid flow, viscous effects, closed conduit flow, pipe network analysis.

291 Survey Camp
A one-week course in surveying. Introduction to surveying, length measurements, levelling, transit surveys. Approximate cost to each student $50.

292 Socio-Economic Aspects of Civil Engineering
An overview of the man-environment interaction. General economic concepts of human welfare and resource allocation, engineering economic decisions, breakeven and minimum cost analysis, engineering methods of resource allocation, scheduling of resource allocation, concepts of interest, time evaluation of tactical and strategic alternatives.

298, 299 Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

300 Civil Engineering Project 2
The detailed design of comprehensive projects by student teams. Each team member is assigned a portion of a project which he is to design. Each of the individual designs are integrated to produce a complete design in the form of a report containing all appropriate calculations and drawings. Particular emphasis is placed on the utilization and integration of knowledge acquired in the more specialized courses.

303 Structural Analysis 1
An introduction to structural analysis. Degree of internal indeterminacy and stability of structural systems; analysis and construction of influence lines for beams, frames, arches and trusses, calculation of displacements; energy principles.

304 Structural Analysis 2
315 Structural Design 1
An introductory course in structural design intended to acquaint the student with the behaviour of typical engineering materials. The behaviour of sections under various loading conditions, the design of connections in steel and concrete structures, design of beams and columns.

342 Urban Transport Planning 1
An introduction to the analytical tools of transport planning. Urban transport planning process, trip generation, modal split analysis, trip distribution, traffic assignment. Economic evaluation of transport systems. Transport technology. Transport plan development and urban planning principles. Prerequisites: CE224, CE292, or equivalents.

343 Urban Transport Planning 2
Applications of the analysis methods of CE342 to actual transport planning problems in Canadian urban areas. Objectives of system planning; land use and travel surveys; census data; synthesis of alternative road and public transport plans; testing and evaluation of plans.

353 Geology and Soil Mechanics
An introductory course in geology and rock mechanics with emphasis on topics related to civil engineering. Mineralogy and petrology, structural geology, geomorphology (especially glacial geology), aggregates, soil classification, permeability and groundwater flow. Approximate cost of field trips to each student $10.

354 Soil Mechanics and Foundations
A study of theories of soil mechanics and their use in soil engineering. Introduction to engineering properties of soils. Procedures for the design of earth structures and shallow foundations.

375 Sanitary Engineering
An introductory course in sanitary engineering. Fundamentals of microbiology and chemistry, water treatment; water quality criteria, clarification, filtration, disinfection, removal of dissolved materials, waste water treatment, characteristics of waste water, disposal of water, primary treatment, secondary treatment, sludge handling, tertiary treatment, industrial wastes.

381 Hydraulics
An introductory course in hydraulics. Open channel flow, hydrometeorological concepts, statistical hydrology, reservoir operation, dimensional analysis, hydraulic structures, hydro electric power.

393 Environmental Engineering
An introduction to environmental, urban and municipal engineering. Characteristics of urbanization, measuring demands for municipal services, developing and testing plans, implementation considerations, performance and measurement consideration.

398,399 Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

400 Civil Engineering Project 3
Design of civil engineering projects, building structures, bridges, highway and municipal engineering works. Emphasis is given to the interrelationship between practical design and the various sciences and disciplines covered in the undergraduate course of studies.

413 Structural Steel Design
A concise presentation of basic features of the behaviour and design of steel structures. Materials, applications. Types of construction; elastic and plastic action; design of tension members, beams, columns, bolted and welded connections, plate girders, composite construction, light gauge members.

414 Structural Concrete Design
A concise presentation of the basic features of the behaviour and design of structural concrete. Physical and mechanical properties of concrete, reinforcing steel, reinforced concrete; generalized flexural behaviour, shear, bond, combined axial and bending applied to singly and doubly reinforced and flanged sections. Structural design and design criteria for continuous beams; yield line analysis for slabs.

415 Structural Design 2
A continuation of CE413 and 414. Loadings, layout, components, assemblage and economics of various building systems; design of one and two-way floor systems; effects of temperature, creep, shrinkage, concentrated loads, etc; industrial and multistory framed structures; bridges.

441 Transportation Economics
A course in public enterprise economics with emphasis on spatial or transportation related effects in economics. Topics include welfare economics, costing, pricing theory, project evaluation and practical application problems.

454 Foundation Engineering
A continuation of CE 354. Engineering properties of soils, special problems and techniques in the design of foundations, earth structures and excavations, shallow and deep foundations, case studies.
481 Engineering Law
General introduction to law and the Common Law legal systems; formation of contracts, effect of mistakes on contracts, interpretation of contracts, breach of contracts, legal remedies; scope and content of technical specifications; sale of goods; introduction to the Law of Agency; the Tort of Negligence, professional negligence; some aspects of restrictive trade practices; introduction to Patent Law.

493 Engineering in the Canadian North
A course designed to provide an introduction to the technical, ecological and sociological problems associated with construction in the Canadian North. Special engineering problems concerning transportation, water supply, foundations, structures, etc., in the northern environment are discussed. Students will be doing engineering and feasibility studies in such areas as railways, pipelines, natural resource explorations, vehicle development and marine anchorages.

498, 499 Seminar
The engineer in society. Principles, methods and practice of Civil Engineering. Informal lectures.

500 Special Project
An independent piece of engineering work, design or research, under the direction of a faculty member.

501 Approximate Analysis of Structures
Simple alternative methods of structural engineering that provide independent checks on more complex analyses or designs are surveyed. Such methods are becoming necessary with the growing automation of structural computations. A deliberate development of understanding of structural behaviour (structural intuition) is attempted. The role of approximation is discussed at all levels, ranging from accepted standard approximations in so-called exact structural mechanics to more intuitive proportioning of structures. Approximate equivalence of continuous and discrete systems: cantilever method, equivalent beams, plates and shells, trusses and grids. Finite element methods; Newmark’s analysis and further simplifications. Moment balancing, load balancing and related methods of pragmatic design. Methods of negligible redundants: portal methods, area method in shells.

504 Structural Analysis 3
Flexibility and stiffness procedures for the analysis of indeterminate structures; matrix methods applied to planar and three dimensional frames; computer applications; problem formulation and solution.

506 Project Management

508 Structural Dynamics and Stability
An introduction to the analysis of the dynamics and stability of civil engineering structures. Vibrations of single and multi-degree of freedom lumped-mass systems for imposed forces or support motions; vibrations beam-girder, plates and slabs; approximate design methods; stability of columns, buckling of continuous beams, buckling of frames, plates and plate-type structures; lateral and torsional buckling problems; approximate methods of analysis.

518 Plates and Shells
A simultaneous development of the elementary methods of analysis and design of plates and shells. Types, uses, typical materials and methods of construction; membrane theory for shells, derivation and solution of governing equation for various cases; elementary bending theory for plates and shells, derivation of governing equations, methods of solution (analytic, tables, codes, series, finite difference, finite elements); limitations of methods, solutions.

520 Advanced Computer Programming for Engineers
An advanced level study of the capabilities of the digital computer and the effective planning of large programmes. Use of functions, subroutines, object decks, load modules, programme libraries, overlay programmes; comparison of different compilers and various systems (FORTRAN, ICES, STRUDL, CPS, WITS, ICETRAN, PL/1); techniques for large systems of equations.
Prerequisite: GE 121 or the equivalent

522 Engineering Analysis
An introduction to the analysis of lumped parameter problems in engineering. Examinations of equilibrium, eigenvalue and propagation problems associated with the formulation techniques, mathematical properties and the various exact and approximate methods of solution; engineering applications: suitability of techniques for machine computation.

524 Probability, Statistics and Decision Theory
An extension of CE 224: objective, subjective and axiomatic probabilities; classical inference; Bayesian decision theory, terminal and pre-posterior analysis; game theory, zero and non-zero sum games, bargaining models; decisions under uncertainty; multiple regression analysis, principal components. Introduction to stochastic processes.
525 Introduction to Finite Element Methods
The concept and theoretical basis of the finite element method are presented as a logical extension to solid body stress analysis of the matrix methods applied to structural frames. In order to obtain an appreciation of the method and its capabilities as an engineering tool students will analyze representative two- and three-dimensional problems using standard programmes. Structures examined include metal plates, concrete slabs, pressure vessels as well as three-dimensional solids. 
Prerequisite: CE 304 or equivalent

526 Continuum Mechanics
An introduction to the analysis of continua. Vectors, Cartesian tensors; tensors of stress, strain and strain rate for a continuum; laws of motion-conservation of mass, momentum integral, kinetic equation of state, first and second laws of thermodynamics; linear elasticity — equations of equilibrium and compatibility, superposition principle, extension and flexure of beams, plane elasticity; plasticity — idealized behaviour, yield conditions and surfaces, plastic potential theory, hardening hypothesis, Hencky's theory, slip line theory; linear viscoelasticity; viscoelastic models, creep, hereditary integrals.

534 Model Analysis of Engineering Structures
A lecture-laboratory study of the use of mechanical models to predict the response to loads of civil engineering structures. Advantages, limitations of model aided, analytic and code-based designs; principles of model similarity and behaviour of geometrically similar structures; investigation of limits of common design procedures; experimental evaluation of static and dynamic load response of models of structures not amenable to analytical solutions; transfer of data to geometrically similar structures; design, construction and test failure of reduced models of simple structures.

536 Model-Aided Design of Engineering Structure
A lecture-project course requiring the model-aided design of civil engineering structures not amenable to design by analytic techniques. Students will design, construct, test and analyse the response of reduced models of structures required to satisfy specified criteria; evaluation of design will be made with recommendations for modification and optimization of original design. Lectures will include: case studies of model-aided optimization of structures and structural components, introduction to theory, principles and design of experiments, measuring systems and transducers.

540 Highway Design
A course in geometric design, highway organization and highway information systems. Freeway design, interchange design, interchange spacing, flexibility of freeways, transportation systems in metropolitan areas, freeway networks, safety.

541 Traffic
A course in traffic analysis and design. Car following theories, delays at street intersections, deterministic and stochastic traffic patterns, computer simulation of traffic behaviour.

542 Pavement Structural Design
A course in pavement design. Soil identification, subgrade design, base courses, flexible pavement design, dense to graded hot mix asphaltic concrete, surface treatments.

543 Land Use Models
An introduction to analytical models for forecasting urban land use patterns. Urban development in Canada, available urban development models, population forecasting, economic activity forecasting, the Lowry model.

544 Systems Analysis
A course in systems analysis technique, linear programming, dynamic programming, networks, decision theory.

545 Transportation Planning Practice
The aim of this course is to expose students to the practice of transportation planning used in several areas of transportation. Case studies will be used to illustrate current practice. Illustrative problems will be drawn from the following areas: airport and air terminal planning; urban rapid transit planning and design; urban and rural freeway and road design; planning and operation of public transport systems for medium and smaller sized cities; planning demand scheduled bus systems. Students will be required to complete a planning and design problem in one area.

551 Engineering Terrain Analysis
An introduction to engineering terrain analysis. Use of geologic and pedologic information and air photo interpretation principles and techniques in the prediction of engineering properties of soils and the planning of engineering soil surveys; geotechnical aspects of permafrost and organic terrain (muskeg); principles and geotechnical applications of other remote sensing systems; terrain evaluation systems.
558 Soil Engineering (Case Histories)
A study of the application of procedures of design and construction of foundations and earth structures through consideration of case histories.
*Prerequisite: CE 454*

560 Mechanical Behaviour of Materials
A review of crystalline and non-crystalline structures. Elastic and inelastic properties, imperfection and plasticity in crystals; plastic deformation and creep; brittle, ductile and fatigue fracture. Plasticity in ceramics and polymers. Cyclic deformation.

572 Topics in Wastewater Treatment

573 Pollution in the Aquatic Environment
A waste management course involving characteristics of receiving waters. Diffusion, biological responses to nutrients, self purification, thermal discharge, limnological aspects.

580 Elements of Water Resources Management
An introduction course in water resources management. Uses of water, institutional characteristics, multi-use of water, water quality management, systems analysis, comprehensive water resources planning.

583 Water Distribution and Collection Systems
A municipal hydraulics and hydrology course. Water and waste-water estimates, water supply and distribution systems, urban hydrology, wastewater collection, hydraulics of treatment works.

586 Hydrology
A course in hydrology, following CE 381. Hydrologic cycle, river basin characteristics, climatology, evaporation, probability in hydrology, hydrographs, time series, data banks, models, floods, groundwater.

589 Open Channel Flow
A course in open channel flow. Classification of open channel flow, energy and momentum principles, critical flow, uniform flow, design of channels, gradually and rapidly varied flows, flood routing.

Note
Courses numbered within 500 series are considered to be undergraduate courses but are intended to form a transition from the undergraduate to the graduate programme in certain areas of Civil Engineering. They serve two major functions:
1) to provide electives for the undergraduate so that the student may specialize in a particular area.
2) to provide background information for the graduate student when such is lacking. Courses of this series may be credited toward a graduate degree.
Department of Classics and Romance Languages

Professor and Chairman of the Department
R. L. Myers

Classics Faculty

Professors
P. Keresztes, M.A.(Toronto), Ph.D.(Graz)
D.C. Mackenzie, B.A., M.A., Ph.D.(Princeton)

Assistant Professors
P. Forsyth, A.B.(Mount Holyoke), M.A., Ph.D. (Toronto)
S.B.P. Haag, B.A., M.A.(Queen's), M.Phil.(Toronto)
R.L. Porter, B.A.(McMaster), M.A., Ph.D.(Princeton)

Spanish Faculty

Professor
J.C. McKegney, B.A.(Western), M.A.(Oregon), Ph.D.(Washington) Diploma(Santander)

Assistant Professors
C.M. Fernandez, Lic. en Arq.(Madrid), M.A.(Tulane), D.Lit. et Phil. Universitas Complutensis(Madrid)
B. Thalman, B.A.(DePauw), M.A., Ph.D.(Ohio State)

Assistant Professor (Part-time) (1974-75)
M. Mackenzie, B.A., M.A., Ph.D. (Rice)

Lecturers
S. Harrison, B.A.(Oxford), M.A.(Toronto)
G. Renart, B.A.(Instituto Miguel Rua), M.A. (Toronto)

Sessional Lecturer
B. Murphy, B.A. (Waterloo)

Italian Faculty

Assistant Professors
E. Evans, B.A.(Calcutta), D.Paed.(Padova) I
(on Sabbatical Leave 1975-76)
A. Gualtieri, B.A.(Toronto), M.A.(Colorado) I

French Faculty

Professors
A. Ages, B.A.(Carleton), M.A., Ph.D.(Ohio State)
J.R. Finn, C.R., B.A.(Western), M.A.(Toronto), Ph.D.(Illinois) I
R.L. Myers, B.A.(Western), M.A., Ph.D.(Johns Hopkins)

Adjunct Professor
A. Wilshere, B.A., Ph.D.(London)

Associate Professors
J.I. Binamé, L.en Phil. rom., Agrégé (Brussels)
J.R. Dugan, B.A., M.A.(Toronto), Ph.D.(Yale)
J. LaFrance, B.Paed., M.A., Ph.D.(Laval)
C. Racine, B.A.(Joliette), Lic. en Péd., Lic.es Lettres, D.E.S.(Montréal), Doctorat ès Lettres(Nice)
W.D. Wilson, M.A., Ph.D.(Trinity College, Dublin)

Assistant Professors
P.H. Dubé, B.A., M.A.(Toronto), Ph.D.(Ohio State)
R.J. Fournier, B.A., M.A., Ph.D.(Western)
P. Socken, B.A.(Toronto), M.A.(Iowa), Ph.D. (Toronto)

Assistant Professor (Part-time) (1974-75)
C. Abbott, B.A., M.A., Ph.D.(Ohio State)

Sessional Lecturers
P. Aplevich, B.A., M.A. (Waterloo)
H.S. Fournier, B.A.(Toronto), M.A.(Western)
M. Frim, B.A.(Western)
M. Hennig, B.A.(Western), M.A.(Waterloo)
E. Kinahan, B.A.(U.B.C.), M.A.(Waterloo)

Oral French (205*/206*) Programme

Co-ordinator
N. Vassiliadis, B.A.-Lic. ès Lettres, M.A.

Monitors (1974-75)
M. Bourque
M. Hardy, Licence-B.A.
C. Lajné, Brevet d'enseignement (Québec)-B.A.
P. Leman, B.Comm.
M. Meyer, Graduée du conservatoire d'art dramatique de P.Q.
B. Paboeuf, Lic. ès Lettres, Maîtrise de Lettres Modernes CAPES
M. Poinot, B.A.
C. Roulston, Lic. ès Lettres, D.E.S., CAPES-AGREGATION
General Remarks

1) The number of lectures per week shown after certain course descriptions is an attempt to indicate the "normal". The instructor will determine how often his particular class will meet.

2) In choosing his course each year, the student should always bear in mind the requirements of the profession he intends to enter after graduation. The members of the department are at all times willing to advise the student if he so wishes.

3) Students entering their second year will require the following number of departmental courses in order to graduate with major or honours standing in French, Spanish or Classics:
   a) Major in 3 year programme—6 courses, except Classics—5 courses
   b) Double honours programme—8 courses (except French and Political Science—7 courses)
   c) Single honours programme—10 courses

Undergraduate Course Descriptions

Classics

Classical Civilization (Courses in Translation)

101* Colossos — The Major Figures of Ancient Greece
An introductory study of the achievement of ancient Greece through some of its most prominent figures. These seminal figures have been selected as representatives, for good or bad, of the Greek experience. Each year two of the following will be featured: Theseus: The Minoan-Mycenaean Age of Bronze; Pericles and the Rise of Democracy; Socrates, Man and Martyr; Alexander the Great and the Age of Expansion.

102* Colossos — The Major Figures of Ancient Rome
An introductory study of the achievement of ancient Rome through some of its most prominent figures. Each year the Roman experience will be examined in two of the following topics: Caesar, Cicero and the Collapse of the Republican Ideal; Augustus: The Empire Rises; Nero and the Corruption of Power; Hadrian and the Imperial Machine.

201* Ancient Greek Society
A survey of several aspects of the civilization of Classical Greece. Topics studied, based on primary (in English translation) and secondary sources, will include the individual, the city, institutions and amusements.
Three lectures, Fall term

202* Ancient Roman Society
A course similar to 201* above, but dealing with Classical Rome.
Three lectures, Winter term

Note
With regard to the following two courses, Classical Civilization 251*—Classical Civilization 252*, the Classics Division will accept History 255 as an alternative for Classics credit. But a student May Not take both History 255 and Classical Civilization 251*—Classical Civilization 252*.

251* Near Eastern and Greek History
A survey of the civilizations of the Near East and of Greece, emphasizing their political, military, social and economic aspects.
This course is acceptable for credit by the History department
Three lectures, Fall term

252* Roman History
A military, political, social, economic survey of Rome from earliest times to the Empire's fall.
This course is acceptable for credit by the History department
Three lectures, Winter term

255* 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.
Three lectures, Fall term. Not offered in 1975-76

256* Mediaeval Civilization
A study of mediaeval literature, art, architecture, music and other expressive forms. The period from the High Middle Ages to Renaissance and Reformation will be studied.
Three lectures, Winter term. Not offered in 1975-76

265* 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.
Three lectures, Fall term

266* Classical Verse in Translation 2
Tragedy, Comedy and Other Verse Forms
A study of classical Greek tragic drama featuring the plays of Sophocles and Euripides. The art of comedy will be examined through the plays of Aristophanes and Plautus. Other verse forms will be studied as time permits.
Three lectures, Winter term
Classics and Romance Languages

270 Mythology and Religion
A general survey of Graeco-Roman mythology. Attention will also be devoted to such topics as the state cults, Oriental mystery religions in the Mediterranean area, and the Ruler Cult and worship of the Roman Emperor.
Three lectures, Year course

321* Forms of Classical and Neo-Classical Satire
A study (in translation) of the major classical writers of satire and of their influence on English writers of the Renaissance and Neo-Classical periods. Forms such as formal verse satire, epigram and Menippean satire will be studied in both Classical and English writers, including Horace, Juvenal, Donne, Pope, Martial, Jonson, Petronius, Lucian, More and Swift. (Same as English 355*) Not offered in 1975-76

322* Pastoral and Mythological Aspects of Classical and Neo-Classical Poetry
A study (in translation) of significant Classical writers using pastoral and mythological elements in their works, and of their influence on English writers of the Renaissance and Neo-Classical periods. Writers such as Ovid, Shakespeare, Theocritus, Vergil, Spenser, Milton, Marvell and Pope will be studied. (Same as English 356*)
Fall term

351* 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*)
Fall term

352* Roman Art and Architecture
A survey of the art and architecture of the Roman world from Etruscan to Imperial times. (Same as Fine Arts 311*)
Winter term

365* Problems in Greek History 1
A detailed study of a selection of problems in Greek History. This course is acceptable for credit by the History department.
Prerequisite: Class. Civ., 251* or History 255
Fall term. Not offered in 1975-76

366* Problems in Greek History 2
A detailed study of a selection of problems in Greek History. This course is acceptable for credit by the History department.
Prerequisite: Class. Civ., 251* or History 255
Winter term. Not offered 1975-76

371* Christianity and the Roman Empire 1
A study of the relationship between Christianity and the Roman Empire from the earliest beginning to 200 A.D. This course includes topics such as the trial of Christ; the trials of Paul before governors of the Empire; the burning of Rome in 64 A.D. and the subsequent outlawing of Christianity; the suppression of the Bacchanals; legislation governing the persecution of Christians, and other topics.
Fall term. Not offered in 1975-76

372* Christianity and the Roman Empire 2
A continuation of the course above. Topics included are the persecutions by the Emperors Decius and Valerian, the 'Great Persecution' and finally the triumph of Christianity under the Emperor Constantine.
Winter term. Not offered in 1975-76

381* From Diocletian to Constantine
The political collapse of the empire and its subsequent division to protect its frontiers and secure an unchallenged succession; economic collapse and measures to bring about recovery; the introduction of oriental ideas of the ruler as the vice-regent of heavenly authority; attempts to revive orthodox paganism and the long persecution of the Christian Church.
Fall term

382* Constantine the Great
His early career and rise to imperial power; his victories over Maxentius and Licinius; the sole ruler of the Roman Empire; his measures to secure the empire and restore the economy; his close relationship with the Christian Church and his efforts to secure its unity; the problems of his conversion to Christianity and the establishment of 'new Rome'. Not offered in 1975-76

386* Classical Prose in Translation
A study of the major prose writers of antiquity in the fields of history and philosophy. Included are Herodotus and Thucydides (Greek history), Plato (Greek philosophy), Livy and Tacitus (Roman history), and Seneca (Roman philosophy). Other authors may be read as time allows.
Winter term. Not offered in 1975-76

490 Roman Civilization and History
Senior seminar. An in-depth study of various problems and aspects of Roman Civilization and History. (Same as History 400)

492*-498* Senior Tutorials
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.
Course Descriptions
Classics and Romance Languages

Greek

Note
All courses in Greek include prose composition assignments.

100 Introductory Greek
A course designed for students beginning the study of Greek or who have not yet reached the level expected in Greek 200. The aim is to attain as rapidly as possible the ability to read simple prose. The emphasis is on forms and structure: reading of connected passages will begin early in the first term.

Year course

200 Epic and Philosophy
An introduction to Greek epic and philosophy, with readings from Plato (selections are usually chosen from the Apology, Crito, Republic, or Symposium) and from Homer (selections from either the Iliad or Odyssey).

Prerequisite: Year 5 Greek, Greek 100 or instructor's permission

Year course

265* History and Historiography
Selections from Herodotus.

Fall term. Not offered in 1975-76

266* Tragedy
Euripides, Medea.

Winter term

365* The Greeks at War
Selections from Thucydides' history of the struggle between Athens and Sparta.

Fall term. Not offered in 1975-76

366* Lyric and Elegiac Poetry
Selections from Lyric and Elegiac Poets.

Fall term

375* Drama 1
Selections from Aeschylus.

Fall term. Not offered in 1975-76

376* Drama 2
Sophocles and Aristophanes. An analysis of the female tragic figure in the Antigone of Sophocles, and of the female comic figure in the Lysistrata of Aristophanes.

Not offered in 1975-76

395*-399* Senior Tutorials
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

Latin

100 Introductory Latin
A course designed for students beginning the study of Latin or who have not yet reached the level expected in Latin 190. 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.

Year course

190 Literature of the Republic
Selections from Plautus, Catullus and Cicero.

Prerequisite: Year 5 Latin, Latin 100 or instructor's permission

Year course.

251* Language Study
Composition, translation, basic grammar with intensive analysis of selected works.

Winter term. Not offered in 1975-76

265* Letters
Selections from the letters of Cicero and Pliny.

Full term. Not offered in 1975-76

266* Epic
A study of three books of Vergil's Aeneid in Latin. The other books will be read in English. The aim is to reach some understanding of Vergil's language, thought and feeling.

Winter term. Not offered in 1975-76

352* Language Study
Composition, translation, basic grammar, with intensive analysis of selected works.

Fall term

365* History and Historiography
Livy, 21, 22; Res Gestae.

Fall term. Not offered in 1975-76

366* Cicero
Selected orations, Caesar, De Bello Civili.

Winter term. Not offered in 1975-76

375* Lyric Poetry
Catullus and Horace.

Winter term

376* Elegiac Poetry
Selections from Tibullus, Propertius and Ovid.

Winter term. Not offered in 1975-76
395* Mediaeval Latin Literature
From Gregory of Tours to Abelard. Selected readings in various genres such as drama and the Cambridge Songs.
*Fall term. Not offered in 1975-76

396* Mediaeval Latin Literature
From the twelfth century to the Renaissance. Selected readings in various genres such as the chroniclers and the Goliardic Songs.
*Winter term. Not offered in 1975-76

465* Philosophy
Lucretius, De Rerum Natura, 1, 3, 5 (selections); Cicero, De Officiis (Selections).
*Winter term

466* Horace the Satirist
Selections from the non-lyric poetry of Horace, particularly the Satires and Epistles Book 1. The poet's survival in both imitations and translations will be briefly considered.
*Fall term

475* Comedy
Plautus, Rudens; Terence, Phormio.
*Fall term. Not offered in 1975-76

476* Historiography and Literary Criticism
Tacitus, Annals 11-16 (selections); Quintilian 10.
*Winter term. Offered in 1975-76 by W.L.U.
Consult Classics Division for information

485* Roman Life in the Empire 1
Juvenal; Petronius, Cena.
*Winter term

486* Roman Life in the Empire 2
Tacitus, Agricola; Suetonius, Nero; Seneca, Apocolocyntosis.
*Winter term. Offered in 1975-76 by W.L.U.
Consult Classics Division for information

490*-496* Senior Tutorials
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

490*-496* Senior Tutorials
By arrangement with the Department, an individual student or a small group of students will follow a course of study under the supervision of a faculty member.

Romance Languages

French

Waterloo at Laval
There is an arrangement between the Department and the Université Laval, at Québec, whereby Waterloo students may study for a year or a term at Laval. Further particulars may be obtained from the Department.

First-year French Courses
Students should read the following carefully in order to enrol initially in the appropriate course. When in doubt, consult the Department.

Level 1: Courses for students who have not studied French before

101* Reading French
An elementary course, taught in English, designed to give the student a rapid and adequate reading knowledge of French. Basic elements of French sentence structure are explained, and reading passages from diverse academic disciplines are studied. This course will not give the student training in oral French.
3 hours in the classroom, 1 hour in the computer laboratory.
Course Admission Requirement: permission of the Department.
*Fall term; Summer session

102* Reading French
A continuation and completion of the work begun in French 101*.
Course Admission Requirement: successful completion of French 101* or permission of the Department.
Winter term; Summer session

Note
Successful completion of French 102* will satisfy the "reading knowledge of French" requirement of University of Waterloo Graduate programmes.

131* Basic French
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.
4 hours in the classroom, 1 hour in the language laboratory.
Course Admission Requirement: permission of the Department
*Fall term; Spring term; Summer Session
132* Basic French
A continuation and completion of the work begun in French 131*.
Course Admission Requirement: successful completion of French 131* or permission of the Department.
Winter term; Summer session

Note
Students completing French 132* with very high standing may petition the Department for admission into the General French or Honours French Degree programmes.

Level 2: Courses for students who have studied French before but have not completed high school Year 5 French

151* Intermediate French
A comprehensive approach to language study. Involves reading, writing and speaking French.
4 hours in the classroom, 1 hour in the language laboratory.
Course Admission Requirement: successful completion of French 132* or permission of the Department.
Fall term; Spring term; Summer session

152* Intermediate French
A continuation and completion of the work begun in French 151*.
Course Admission Requirement: successful completion of French 151* or permission of the Department.
Winter term; Summer session

Note
Students completing French 152* with high standing may petition the Department for admission into the General French or Honours French Degree programmes.

Level 3: Courses for students who normally have completed high school Year 5 French, or who have otherwise acquired an equivalent command of French

190 French Language and Civilization
This intensive course, taught in French, has two components:
a) French language: emphasis on oral expression, comprehension, reading and writing;
b) Lectures on French civilization from the Middle Ages to the present day.
3 hours per week language study, 1 hour per week language laboratory, 2 hours per week lecture.
Course Admission Requirement: Year 5 French or successful completion of French 152* or permission of the Department.
Year course: Fall and Winter terms

191 French Language and Literature
This intensive course taught in French, has two components:
a) French language: emphasis on oral expression, comprehension, reading and writing;
b) Lectures and discussions on a selection of French literary masterpieces.
3 hours language study, 1 hour language laboratory, 2 hours lecture and discussion.
Course Admission Requirement: Year 5 French or successful completion of French 152*; or permission of the Department.
Year course: Fall and Winter terms

192 French Language
A very intensive French language course, taught in French. Emphasis will be placed exclusively on strengthening oral expression, comprehension of spoken French, reading and writing skills.
4 hours in the classroom, 1 hour per week language techniques.
Course Admission Requirement: Year 5 French or successful completion of French 152* or permission of the Department.
Year course: Fall and Winter terms; Summer session

Note 2
Credit will not be awarded to any student for more than one of French 190, 191, 192 or 195* /196*.

Note 3
Successful completion of any course at this level automatically entitles the student to register in the General or Honours Degree programme in French.
195* Oral French for Co-op Students (formerly French 105*)
Intensive oral and aural training in the classroom as well as in the language laboratory, exercises in comprehension and conversation.
3 hours in the classroom, 2 hours in the language laboratory
Course Admission Requirement: completion of Year 5 French or equivalent, or completion of French 152* or by permission of the Department
Fall term; Winter term; Spring term

Note
Students with credit for the former French 105* may not enroll in this course

196* Oral French for Co-op students (formerly French 106*)
A continuation and completion of work begun in French 195*.
3 hours in the classroom, 2 hours in the language laboratory.
Course Admission Requirement: successful completion of French 195* or French 105* or permission of the Department
Fall term; Winter term; Spring term

Note
Students with credit for the former French 106* may not enroll in this course

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, in the Department's view, attained a level of competence either inferior to or superior to the levels of competence outlined in each course description. In order to permit proper evaluation of performance in the French Language Placement Test, the Department reserves the right to delay as necessary the commencement of classroom instruction.

Second-year French Courses:
200 Introduction to the study of French Literature
Designed to help students develop skills in the reading and analysis of French literary texts. A selection of texts - poetry, drama and prose - will be studied primarily with respect to their inner structural relationships, although their social and literary-historical context will also be taken into account. Taught in French
Course Admission Requirement: French 190 or permission of the Department
3 hours in classroom
Year course

205* 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.
3 hours in the classroom, 1 hour in the language laboratory
Course Admission Requirement: normally one of: French 152; 190, 191, 192, 106* or 196*, or by permission of the Department
Fall term; Winter term

206* Spoken French
Continuation and completion of work begun in French 205*.
Course Admission Requirement: French 205* or permission of the Department
Winter term

Note 1
Each classroom section of this course will be limited to a maximum enrolment of 12 students.

Note 2
A student may repeat the course, on successive levels of difficulty. He/she will, however, receive a maximum of 1 credit for the course regardless of the number of times it is taken.

Note 3
A student registered in the General French or Honours French Degree programmes may include this course as one of his/her non-French electives (regardless of the number of times he/she may repeat). He/she may not count this course as one of the French courses required to complete his/her degree.

250 French Language
Continued training in spoken and written French, with a concentration on more difficult problems of the language.
4 hours per week, including language laboratory
Course Admission Requirement: French 190 or French 106* or permission of the Department
Year course: Fall and Winter terms

251* French Language
Fall term of French 250; see note below.

252* French Language
Winter term of French 250; see note below.

Note
These half-courses are available only to students in the co-operative System or with the permission of the Department.
271* Poetry and Song in Québec
An initiation to Québec poetry through the phenomenon of French-Canadian song and its principal themes. Analysis of works by the principal chansonniers: Félix Leclerc; Gilles Vigneault; Raymond Lévesque; Claude Léveillé, Marie Savard; Monique Miville-Deschênes; Georges Dor; Sylvain Lelièvre; J.P. Ferland; Robert Charlebois; Jacques Michel; etc. Taught in French
Fall term

272* Introduction to the French-Canadian Novel
The course will deal with about seven novels, including ones by Gabrielle Roy and Gérard Bessette. The themes of the "roman de la fidélité", the "roman social" and the "roman intérieur" will be studied. Taught in French
Winter term

273* Aspects of Québec
A presentation of traditional and contemporary Québec in the fields of the Arts, literature, music, politics and society. Taught in French
Not offered in 1975-76

291* 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.
No Course Admission Requirement
3 hours in classroom
Fall term

Note
This course will be taught in English except in the Correspondence programme, where lectures are in French. It is open to Arts students in second year and higher, and to others in any year. Open to students majoring or honouring in French only with the permission of the Department.

292* 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 popular music, art, politics, industry, etc.
Course Admission Requirement: French 291* is recommended
3 hours in classroom
Winter term

Note
See note under French 291*.
Literature Courses

Period Numbering System

409-419 Medieval Language or Literature
420-429 Renaissance Literature
330-339, 430-439 17th Century French Literature
340-349, 440-449 18th Century French Literature
350-359, 450-459 19th Century French Literature
360-369, 460-469 20th Century French Literature
370-379, 470-479 French Canadian Literature

(Courses offered in the above number sequences may vary from year to year, and course numbers will be adjusted accordingly. Although there are no firm Course Admission Requirements, it is recommended that the student have completed a literature course on the 200 level.

Note 1

The Department requires that students registered in the General French degree programme complete, before graduation, at least three full credits in French on the 300 or 400 levels. Of these, one half-credit must be taken in at least three of the areas listed above.*

Note 2

The Department requires that students registered in the Honours French degree programme complete, before graduation, at least six full credits in French on the 300 or 400 levels. Of these, one half-credit must be taken in at least six of the areas listed above.*

Note 3

The Department requires that students registered in a Joint Honours programme combining French with another subject complete before graduation, at least four credits in French on the 300 or 400 levels. Of these, one half-credit must be taken in at least five of the above areas.*

*The above requirements will apply only to students completing their second year in the Winter term of 1975, or later.

331* Le Grand Siecle
A study of those major authors of the seventeenth century who, by influence or by reaction, provide the foundations of many future literary works. Taught in French

341* Eighteenth Century Literature: The Aesthetic Dimension
Readings in the novel, drama and poetry, and criticism of the eighteenth century. Taught in French

351* Romanticism
A study of the French novel from 1800-1850. Selected authors will include Chateaubriand, Constant, Balzac, Stendhal, Hugo and mérimée. Taught in French

352* Realism and Naturalism
A study of the French novel from 1850-1900. Authors studied will include Flaubert, Maupassant, Zola and Huysmans. Taught in French

361* Contemporary French Literature
A study of selected texts by authors such as Sartre, Camus, Ionesco, Robbe-Grillet, Vian. Taught in French.

362* Gide, Proust and their contemporaries
A study of some of the most significant literary works of the early part of the twentieth century in France. Attention will be paid to the historical, social and intellectual background. Taught in French

375* Contemporary French-Canadian Novel
A study of a limited number of texts by authors such as Gabrielle Roy; Anne Hébert; Jacques Godbout; André Langeven; Hubert Aquin; Gérard Bessette. Taught in French

376* The “essai” in French Canada
An analysis of the French-Canadian cultural phenomenon since 1950, through the works of the principal “essayistes”. The word “cultural” is taken in the wider sense, implying literature, culture, politics, art, etc. Taught in French

409* Medieval French Language
An introduction to the early development of French.

421* French Prose of the Renaissance
Readings in sixteenth-century literature: Rabelais, Montaigne, etc. Taught in French

422* French Poetry of the Renaissance
Readings in sixteenth-century poetry: Marot, the Pléiade, the baroque poets, etc. Taught in French
431* Classical French Tragedy  
The rise and decline of classical French tragedy from Corneille to Voltaire. Taught in French  
Winter term

441* "The Philosophes": French Prose Writers of the Eighteenth Century  
Selected texts from Voltaire, Rousseau, Diderot, etc.  
Taught in French  
Not offered in 1975-76

443* Comedy and “drame bourgeois” of the 18th Century  
A study of examples of the comedy and “drame bourgeois” of the 18th century: Marivaux, La Chaussée, Voltaire, Diderot, Palissot, Sedaine, Beaumarchais.  
Taught in French  
Fall term

451* Movements and Themes in Nineteenth Century Poetry  
A survey of lyric poetry in the nineteenth century.  
Taught in French  
Fall term

461* French Literature between the Wars  
A study of some of the most significant literary works of the period in their historical, social and intellectual setting. Taught in French  
Not offered in 1975-76

471* French-Canadian Poetry  
A study of its evolution from Octave Crémazie to Anne Hébert. Taught in French  
Fall term

472* 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; Françoise Loranger; Anne Hébert; Jacques Ferron; Jacques Langirand; Michel Tremblay. Taught in French  
Winter term

490*-498* Senior Tutorials  
By arrangement with the Department, an individual student or a small group of students follows a course of study under the supervision of a faculty member.

Italian  
The following courses are administered by St. Jerome’s College

110J 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. In addition, liberal use will be made of the language laboratory where the student will hear and be able to imitate authentic pronunciation and intonation of the language as spoken by natives of sunny Italy. Simple readings in Italian literature will give the student an opportunity to become familiar with vocabulary and style, as well as idomatic expressions that make up such a great part of the language.  
3 lectures and laboratory

210J Intermediate Italian  
Advanced study of grammar, intensive study of one novel. Some finer points of grammar will be studied but will actually be a secondary aspect. A survey course in Italian literature of the Risorgimento (19th century) will be offered, giving special emphasis to the major writers of this period. Further familiarization with the spoken work will be afforded through use of the language laboratory.  
Prerequisite: Italian 110J or permission of the instructor  
3 lectures and language laboratory  
Year course

230J 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, Art, Music and her contribution to the world and to North America in particular.  
Prerequisite: Second Year standing  
3 lectures

310J Italian Literature  
Continued survey of Italian literature with selected readings in prose and poetry, including one novel. One semester devoted to the Divina Comedia: Inferno.  
In the third year the student will complete a survey course of Italian literature of the 19th and 20th centuries. Stress will be placed on the major authors and one play and novel will be studied intensively. (Not offered 1975-76)  
Prerequisite: Italian 210J  
3 lectures  
Year course
Classics and Romance Languages

320J Classical Literature
An anthology of Italian classics will be studied. A number of book reports and Italian essays are required. Two texts will be studied intensively: Divina Comedia: II Purgatorio, and a modern novel. Prerequisite: Italian 210J. 3 lectures
Year course

391J Italian Novel
Selected novels of the Post World War II period.

392J Italian Poetry
Selected readings in contemporary lyric poetry.

Spanish

101* Introduction to Spanish
Intensive drill in the fundamentals of grammar, comprehension and speaking. Some reading, translation and composition. The language laboratory is used as an integral part of the course.
3 hours in the classroom, 2 hours in the language laboratory
Fall term

102* Introduction to Spanish
A continuation of Spanish 101*.
3 hours in the classroom, 2 hours in the language laboratory.
Course Admission Requirement: Spanish 101* or permission of the Department
Winter term

191* Intermediate Spanish
For students with some knowledge of Spanish. Seeks to reinforce the language, both oral and written, through selections from literary works and grammar review. The language laboratory is also used to increase understanding and speaking skills.
Students wishing to enrol will be required to take the Spanish Language Placement Test administered by the Department at the beginning of the Fall term.
3 hours in the classroom, 1 hour in the language laboratory
Course Admission Requirement: Spanish 101* or 102* or Grade 13 Spanish.
Fall term

†The Spanish Language Placement Test is designed to assist the student in finding the 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 or superior to the levels of competence outlined in each course description.

192* Intermediate Spanish
A continuation of Spanish 191*.
3 hours in the classroom, 1 hour in the language laboratory
Course Admission Requirement: Spanish 191* or permission of the Department
Winter term

210 Spanish Civilization
A study in English of the main historical and cultural currents in Spain and Spanish America. No knowledge of Spanish is required.
3 hours
Year course

251* Composition and Conversation
Intensive language study based on literary texts, including grammar, comprehension, oral discussion and essay writing.
Course Admission Requirement: Spanish 191*–192*
Fall term

252* Composition and Conversation
A continuation of Spanish 251*.
Course Admission Requirement: Spanish 251*.
Winter term

255* Survey of Spanish Literature
A brief survey of Peninsular Spanish literature since the Poema de Mío Cid.
Course Admission Requirement: Spanish 191*–192*
Fall term

256* Survey of Spanish American Literature
A survey of literary trends and most significant works from the Conquest to the present.
Course Admission Requirement: Spanish 191*–192*
Winter term

265* The Spanish Short Story
Selected stories from outstanding writers of the 19th and 20th centuries in Spain.
Fall term

266* The Spanish American Short Story
Selected stories from outstanding writers of the 19th and 20th centuries in Spanish America.
Winter term

315* Lyric Poetry of the Golden Age
A view of Spanish poetry, particularly the sonnet, from Garcilaso to Quevedo.
Fall term

316* The Theatre of the Golden Age
Dramatic theory and practice from Lope de Vega to Calderón.
Winter term
325* Don Quijote
An in-depth study of the Quijote.
Fall term. Not offered in 1975-76

326* The Picaresque Novel
Intensive study of the major picaresque novels from
Lazarillo de Tormes to El Buscón
Winter term. Not offered in 1975-76

331* The Spanish Novel in Translation
An in-depth study of the peninsular novel, including
the Picaresque, Don Quijote, the 19th-Century
Realistic Novel, the Generation of 1898, and the
Post-Civil War.
Taught in English
Fall term

Note
No Spanish Credit for majors and honours students.
It is not acceptable as fulfilling the A(ii) requirement.
Fall term

344* Romantic Drama and Poetry in Spain
A study of the most important dramatists and poets
of the Romantic literature of the 19th century.

345* The Novel of the Nineteenth Century
Costumbrismo, romanticism, realism and naturalism
in the peninsular novel of the past century.
Winter term

346* Galdós
Study of Fortunata y Jacinta and two other repre-
sentative novels of Pérez Galdós.
Winter term
Not offered in 1975-76

351* Advanced Composition and Conversation
Writing of essays and discussion based on selected
themes or topics relating to Spain or Spanish Amer-
ica. Formal grammar and translation are also
included.
Course Admission Requirement: Spanish 251*-252*
Fall term

352* Advanced Composition and Translation
A continuation of Spanish 351*.
Course Admission Requirement: Spanish 351*
Winter term

385* Spanish American Poetry from the Conquest
to Modernism
A study of the texts of poets representing the major
developments of colonial and nineteenth-century
poetry.
Fall term

386* Modern Spanish American Poetry
A study in depth of major poets and movements
since Modernismo.
Fall term

395* Spanish American Prose
A critical study of Spanish American prose from the
Cortés letters to the works of Sarmiento.
Fall term

396* Recent Spanish American Prose
A critical study of masterpieces in prose from Sarm-
iento to the present.
Winter term

415* The Prose of the Generation of '98
A study of selected prose with emphasis on the novel
and the philosophical essay.
Fall term. Not offered in 1975-76

416* Drama and Poetry of the Generation of '98
Spanish poetry and drama from Antonio Machado
to Juan Ramón Jiménez.
Winter term. Not offered in 1975-76

440 Mediaeval Spanish Literature
Readings in texts from the 11th century to the end
of the 15th century, including all of the Cid, El libro
de buen amor, and La Celestina. Some study of the
evolution of the language.
Not offered in 1975-76

490*-494* Senior Tutorials
By arrangement with the Department, an individual
student or a small group of students will follow a
course of study under the supervision of a faculty
member.

495* The Novel in Mexico
Principal stress will be placed on novels dealing
with the Mexican Revolution.
Winter term

496* The Novel in the Andean Countries
The works of selected novelists from Colombia,
Ecuador, Peru and Bolivia, principally from the 20th
century.
Fall term

Note 1
By arrangement, 400-level courses in 20th-century
Peninsular Literature and senior composition and
conversation will be taught at Wilfrid Laurier Uni-
versity. Please check Cross-Registration procedures.
Communications Studies Programme

Programme of Studies
Students will enrol at the University of Waterloo in the Faculty of their choice. Those enrolled in general degree programmes at the University may elect communication studies as a major area of study. Students enrolled in honours programmes may elect communication studies as a minor area of study. In each case, a total of five communication course credits must be taken to qualify for the appropriate degree recognition.

The Communication Studies Programme consists of a set of introductory core courses and three theme areas. The core segment provides a distinct focus while at the same time contributes to an interdependent set of studies.

The courses included in the core segment are:

**Arts 100 Communications**
An examination of the origins, evolution, and future dimensions of communications media designed to facilitate an understanding of the adequacies and inadequacies of media, to relate them to the purposes of human awareness, and to explore needs and means of maintaining accountable controls over the media. The course seeks to assist students in discovering the range of informational, research and exploratory resources open to them; in gaining some preliminary experience in utilizing such sources; and in applying a critical judgment of material secured. (Arts 100 is a multi-media course offered in part on Channel 19 TV.)

**General Engineering 062A-B Introduction to Human Communication Systems**
Describing and analyzing the range of human communication behaviours. The course will focus upon a variety of communication systems including man-man, man-machine, and machine-machine communication systems. Various models of communication systems will be examined. Using a systems approach, such concepts as redundancy, entropy, feedback, openness-closedness, equifinality, nonsummativity, relationship, determinism, homeostasis, stability, uncertainty and process will be examined.

Various art forms such as films and computer graphics will be considered.
3 hours per week, lectures and seminars

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**Sociology 270* Communications**
This course undertakes an analysis of the role of language and other symbol systems in social interaction; the interplay between communication and the social system; the formulation of attitudes through language; social and individual disorders as caused by, and reflected in, the breakdown of the communication process.
Prerequisite: Soc. 101*
2 lectures, Fall term

**Philosophy 341* Decision and Value Theory**
A systematic study of the basic concepts in decision-making theories and their associated value theories. Special emphasis will be devoted to the definition and measurement of utility functions and to the various criteria employed in models of decision-making under uncertainty and under risk. Extensive use will be made of literature from Economics, Political Science, Psychology, and Mathematical Statistics.
Prerequisite: Consent of instructor
3 hours

The student is required to elect three of the core courses, two of which must be taken in the first year.

Communication Theme Areas
In addition to the introductory core courses, students will continue their communication studies in one or more of three theme areas, representing a more specific area of study.

A) Mass Media Systems

1) **Arts 200G* Issues in Mass Communication**
The emphasis of the course is on the role of the mass media in national and international communications and covers such topics as truth and deception, propaganda, legal controls, economic and political factors, government information systems, language and stereotypes, and mass media systems.
3 lectures, Winter term

2) **IFS 300 Media Writing Exposition**
An examination of the terms and forms of expression characteristic of non-fiction presentations in the media of print, radio and television. Lectures, seminars and workshops will be combined to seek to establish basic criteria for media expositions, to assess them and apply them to individual student projects.
3 hours
3) Mass Communication and the Rule of Law
Beginning with the proposition that any mass medium is by its nature essentially incompatible with any system of rule of law, the course will explore selected areas of mass media responsibility, for both publicly and privately owned systems, and the ways in which such responsibilities conflict with the law. The "right" of publics to know and the legal basis for the control of information will be examined.

4) Communication Systems Administration
The course will examine the organizational and financial structure of media systems, ownership, and control patterns, the organization and operation of information, acquisition, internal processing, and dissemination. The course will examine mass media operations in Canada, the United Kingdom and the United States.

B) Communication Systems Design

1) SD 371 Introduction to Human Communication Systems
The course focuses upon a variety of communication systems including man-man man-machine and machine-machine systems. Various models of communication systems will be examined paying particular attention to the assumptions and situational factors upon which the models are based. Using a systems approach such concepts as redundancy, entropy, feedback, openness-closedness, equi-finality, nonsummativity, homeostasis and stability, etc., will be examined.

2) SD 471 Communication Media
The course encompasses the tools of communication and the nature and use of communication media. There will be a particular emphasis on those media containing a large technological component; machine-mediated human communication systems, e.g., computer graphics, film, T.V., etc.

3) SD 473 Inter-Cultural Communication
The problems of designing a human communication system where more than one culture is involved. Anthropological, sociological, psychological, political, economic and technological aspects of such design. Environmental perception, value systems, social forms, etc.

4) SD 475 Man-Machine Communication Systems
The nature and design of machine-oriented human communication systems. Consideration will be given to displays, computer graphics, computer-aided instruction and mass communication media (film, T.V., radio, print). The design of a new media innovation. A systems approach will be adopted with special attention to the socio-economic effects of such systems.

C) Communications and Environmental Studies

1) M-Env 240* Small Groups and the Environment
This course will focus on the ways small groups of people function. The emphasis will be on analyzing and understanding how the various groups concerned with environmental issues operate and how they might be made more effective.

No prerequisite
3 hours, Fall term

2) M-Env 260(Y) Visual Perception and Communication
An exploration of images, symbols and ideas which constitute the basis of evolution in the perceptual and communication processes. Special emphasis will be placed on films and some of the major movements in art and architecture.

Prerequisite: Consent of instructor
5 hours

3) M-Env. 262* Environment of the Future
An imaginary look at the Future, both in terms of extrapolating from the present and postulating new, unforeseen and unforeseeable forces that may be at work in the future.

Prerequisite: Consent of instructor
5 hour, Winter term

4) M-Env. 360 Science, Technology, Art and Environment
An interdisciplinary exploration of concepts and themes which unify many aspects of nature and human artifacts. Such themes as Nature of Time as expressed in films, poetry, art, science fiction, psychology and nature are discussed.

Prerequisite: Consent of instructor
5 hours

5) M-Env. 361* Contemporary Media of Communication and Human Environment
A study of "heroes" and "anti-heroes" of the "counter-culture", with special emphasis on the "new wave" movements in cinema, theatre, art and literature.

Prerequisite: Serious pupils only, with the consent of the instructor
5 hours, Winter term

6) M-Env. 440 Honours seminar: Environmental Communication and Education
A study of communication, innovation and educational processes in the context of environmental issues. Approaches to environmental education and communication for primary and secondary school programmes and adult education.

2 hours seminar
Not offered in 1974-75
Drama and Theatre Arts Group

Associate Professor, Chairman of the Department
W.R. Chadwick, B.A., M.A.(Toronto), Ph.D.(London)

Assistant Professors
C.S. Hedges, B.A.(Northeastern, Okla), M.F.A. (Art Institute of Chicago)
K.J.R. Wylie, B.A.(U.B.C.), M.F.A.(Hawaii)

Lecturers (Part-time)
L. Coutts
M. Evans

General Programme Requirements

A total of fifteen full courses including Faculty of Arts Group A and B courses required with an overall cumulative average of at least C - and a cumulative major average of C.

1) Six of the student's courses must be in Drama and Theatre Arts

2) Drama 101* and 102* are the required pre-requisites for most Drama and Theatre Arts courses.

3) Each student must satisfy the following requirements:
   A) Drama 329 (History of the Theatre)
   B) Drama 430* (Theatre Criticism)
   C) One full course from each of two of the following categories:
      1) Performance: Drama 225, 226*, 227*, 325
      2) Production: Drama 228*, 229*, 242, 326*, 327*, 330, 426*, 427*, 442
      3) Other Drama and Theatre Arts courses including Drama 301*, 302*, 421, 422, 425, 429*, 490*
         A-E, 491*A-E or approved Inter-Disciplinary courses in Fine Arts, Dance, Classics, English or other related departments
   D) One and one-half courses from Dramatic Literature to be chosen from: Drama 201*, 202*, English 232*, 233*, 362*, 363* or other approved courses in dramatic literature

Undergraduate Course Descriptions

First Year

Introduction to the Theatre 1 and 2 (Drama 101* and 102*) are recommended as first year courses and are prerequisite to most Drama and Theatre Arts courses. Students planning to major in Drama and Theatre Arts should confer with the Undergraduate Adviser for the Division before registering.

Note

The normal number of lectures per week in each course is three; however, each instructor determines how often his particular class will meet.

Laboratory sessions and rehearsal periods may be added to any course at the discretion of the instructor.

101* Introduction to the Theatre 1

Introductory study of the theatre as a major art form. Selected plays as produced in their historical context. Examination of the major genres. Contributions of the actor, director, designer, and technician to theatrical production. Practical work-shops in scenes from plays studied. Course will consist partly of lectures and partly of smaller tutorial groups.

3 hours per week
102* Introduction to the Theatre 2
An extension of the studies described in 101*.
Prerequisite: Drama 101*

201* Survey of Dramatic Literature 1
A survey of dramatic literature from classical times to the early Renaissance.

202* Survey of Dramatic Literature 2
A survey of dramatic literature from the Renaissance to the present.

225 Fundamentals of Acting
An introduction to the basic techniques of acting. Laboratory experience in movement, voice, improvisation, characterization, and scene study. Laboratory and production participation required.
4 hours per week
Prerequisite Drama 101* and 102* and Consent of Instructor

226* Seminar in Techniques 1
A series of workshop seminars by visiting lecturers dealing with stage movement and vocal production for the actor, with special study in stage fighting, mime, and makeup. Class meets as arranged. May be taken concurrently with 225 or 425.
Prerequisite: Drama 101*, 102*, 226* and Consent of Instructor

227* Seminar in Techniques 2
An extension of the studies described above in 226*.
Prerequisite: Drama 101*, 102*, 226* and Consent of Instructor

228* Design for the Theatre 1
An introduction to the problems of designing for the theatre. Work for the course will include the preparation of drawings and models as well as practical experience in the theatre.
Prerequisite: Drama 101*, 102* and Consent of Instructor

229* Design for the Theatre 2
An extension of the studies described above in 228*.
Prerequisite: Drama 101*, 102*, 228* and Consent of Instructor

242 Introduction to Technical Production
Theory and practice of building, painting, rigging, and shifting scenery; construction of properties; familiarity with lighting instruments, sound equipment and their control systems.
Prerequisite: Drama 101*, 102* and Consent of Instructor

301* Script Interpretation 1
Advanced study and analysis of plays in the process of production covering selected periods and types of play writing, for example: Renaissance tragedy, Restoration comedy, modern realism, the theatre of the absurd. Teaching will follow the contours of drama productions planned in the year.
3 hours per week with study lab sessions by arrangement
Prerequisite: Drama 101*, 101*, 201, 202* or equivalent

302* Script Interpretation 2
An extension of the studies described above in 301*.
Prerequisite: Drama 101*, 102*, 201*, 202* or equivalent, and 301*

325 Directing 1
Analysis of production and performance problems from the director's point of view. Planning the interpretative concept of a production. Study in the principles of stage direction. Special projects in directing, including the production of a Workshop production.
3 hours per week with rehearsal lab sessions by arrangement
Prerequisite: Drama 101*, 102*, 201*, 202* or equivalent, and Consent of Instructor

326* (a,b,c) Special Studies in Theatre Production 1
Production participation and the study of selected problems of theatrical production.
Classes meet 3 hours per night, 5 nights per week for 8 weeks during production rehearsals
Prerequisite: Consent of Production Director for Fall term

327* (a,b,c) Special Studies in Theatre Production 2
Production participation and the study of selected problems of theatrical production.
Classes meet 3 hours per night, 5 nights per week for 8 weeks during production rehearsals
Prerequisite: Consent of Production Director for Winter term

329 History of the Theatre
A survey of theatre history from ancient to modern times with attention to the development of theatre architecture and its relationship to the acting, directing, design, and literature growing out of the various periods and cultures.
3 hours per week
Prerequisite: Drama 101*, 102*, 201*, 202* or equivalents
330 Costuming
Design and practice in the construction of costume for the stage. Research into the historical styles of costumes from antiquity to the present and the adaptation of these styles to stage use. Laboratory and production participation required.
2 hours lecture and 4 hours lab per week
Prerequisite: Drama 101*, 102*, 201*, 202* or equivalents

422 Directing 2
Consideration of problems involved in the directing of a production with exercises in production and staging of specific scenes. Each student in the course will be required to form his own production company and mount a play.
4 hours per week with labs by special arrangement
Prerequisite: Drama 101* 102*, 201*, 202* or equivalent, 325 and consent of Instructor

425 Acting 2
Advanced work in acting including further work in improvisation and non-scripted materials as well as character development and scene study; course involves individual and ensemble work in selections from specific plays with attention given to various periods and styles in acting.
4 hours per week
Prerequisite: Drama 101*, 102*, 225 and Consent of Instructor

426* Theatre Workshop 1
Participation in stage production for advanced students.

427* Theatre Workshop 2
Participation in stage production for advanced students.
Prerequisite: 101*, 102*, 201*, 202* or equivalent. Permission of play Director

429* History of Dramatic Criticism
A study of dramatic criticism from antiquity to the present.
3 hours per week
Prerequisite: 101*, 102* 201*, 202* or equivalent

430* Theatre Criticism
A study of the criticism of theatre production and performance.
3 hours per week
Prerequisite: Drama 101*, 102* 201*, 202* or equivalent

442 Theatre Technology
Advanced study and practice in the various aspects of the technology of the theatre: theatre architecture and equipment, scene shop practice; theory of theatre lighting design, preparation of plots and production operation; sound: acoustics, reinforcement systems, effects. Production participation involving 3 hours per night for 5 nights a week for 2 ½ weeks in either the Fall or Winter term is required.
2 hours lecture and 3 hours lab per week
Prerequisite: Drama 101*, 102*, 242 and Consent of Instructor

490* A-E Seminar in Drama and Theatre Arts
A seminar in special areas of drama and theatre.
Prerequisite: Drama 101*, 102*, 201*, 202* or equivalents

491* A-E Selected Seminars in Drama and Theatre Arts
A continuation of 490* A-E of selected seminars in special areas of study in drama and theatre arts.
Prerequisite: Drama 101*, 102*, 201*, 202*, and Consent of Instructor

499 Senior Seminar
Designed to give the theatre arts major an opportunity to complete a comprehensive presentation project in his major area of concentration during his senior year. This presentation may take the form of an exhibit, a production thesis, or a recital. In some cases the student may elect to do a research thesis and a comprehensive examination.
Students will meet with the entire faculty for an intensive discussion of the presentation.
2 hours lecture per week with lab sessions by arrangement

Note
This course is required of all Honours Theatre Arts majors and open only to students in their fourth year.
Department of Earth Sciences

Professor, Chairman of the Department
R.N. Farvolden, M.Sc.(Alberta), Ph.D.(Illinois)

Professor, President of the University
B.C. Matthews, B.S.A.(Toronto), A.M.(Missouri), Ph.D.(Cornell)

Professors
P.F. Karrow, B.Sc.(Queen's), Ph.D.(Illinois)
P.G. Morris, B.Sc.(London), M.Sc.(British Columbia), Ph.D.(McGill)

Associate Professors
E.C. Appleyard, B.Sc.(Western), M.Sc.(Queen's), Ph.D.(Cambridge)
C.R. Barnes, B.Sc.(Birmingham), Ph.D.(Ottawa)
J.A. Cherry, B.E.(Saskatchewan), M.S.(Cal. Berkeley), Ph.D.(Illinois)
P. Fritz, Dipl. Geol., Dr. Rer. Nat.(Technische Hochschule Stuttgart)
O.L. White, B.Sc.(Melbourne), M.A.Sc.(Toronto), Ph.D.(Illinois)

Assistant Professors
E.O. Frind, B.A.Sc., M.A.Sc., Ph.D.(Toronto)
J.P. Greenhouse, B.Sc., M.Sc.(British Columbia), Ph.D.(California)
D.E. Lawson, B.Sc., M.Sc.(New Brunswick), Ph.D.(Reading)
A.V. Morgan, B.Sc.(Leicester), M.Sc.(Calgary), Ph.D.(Birmingham)
E.J. Reardon, B.Sc.(St. Francis Xavier), Ph.D.(Penn. State)

Research Assistant Professor
R.W. Gillham, B.S.A.(Toronto), M.Sc.(Guelph), Ph.D.(Illinois)

Adjunct Professors
C.I. Dell, B.A., M.A.(Toronto), Ph.D.(Michigan)
W.A. Meneley, M.Sc.(Saskatchewan), Ph.D.(Illinois)
P.H. von Bitter, M.Sc.(Acadia), Ph.D.(Kansas)

Senior Demonstrators
M.L. Copp, B.A.(Minnesota)
D. Nowlan, B.A.(Trinity)

Undergraduate Course Descriptions

Earth Sciences 130, or the consent of the instructor, is prerequisite for all later courses in Earth Sciences. However, Science 100* may be substituted for Earth Sciences 130 as prerequisite for Earth Sciences 235*, 236* and 336*. Second and third year courses usually involve field trips in the fall. All those majoring in Earth Sciences are required to take a two-week field camp at the end of third year and attend a week-long field excursion at the start of third year. (Expenses in excess of $100 are to be anticipated.) Earth Sciences students are encouraged to seek geological employment in the summers.

130 Introductory Geology
An elementary introduction to rocks, minerals, and fossils, geological processes and their effects, structural geology, economic geology, and historical geology. Map study. Field trips. 2 lectures, 3 hours laboratory; Students who are taking, or have taken Science 100* may not take Earth Sciences 130 for credit because of overlapping material.

221* Geochemistry 1
Origin and abundances of elements. Chemical characteristics of sedimentary, igneous, and metamorphic rocks. The geological application and interpretation of geochemical data in sedimentary and exploration geochemistry. Introduction to isotope geology and radiometric dating. 2 lectures, 3 hours laboratory, Winter and Spring terms

231* 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. 2 lectures, 3 hours laboratory, Fall term

232* 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. Prerequisite: Earth Sciences 231* 2 lectures, 3 hours laboratory, Winter and Spring terms
235* Stratigraphy
The principles of stratigraphy, and an introduction to the structural framework of North America.
2 lectures, 2 hours laboratory, Fall term

236* 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.
2 lectures, 2 hours laboratory, Fall term

260* Introductory Structural Geology
An introduction to the deformation of rocks, the effect of stress on rock materials, the application of experimental and theoretical data to naturally deformed rocks (tectonites); elementary rock mechanics; the results of deformation, the types of structures produced; the analysis of simple structures.
2 lectures, 2 hours laboratory, Winter and Spring terms

331* Igneous Petrology
The principles and theories of igneous rock genesis. Silicate phase equilibria in magmatic systems. Magma differentiation; distribution and occurrence of magma types.
Prerequisites: Earth Sciences 231*, 241*
2 lectures, 3 hours laboratory, Fall term

332* Metamorphic Petrology
Prerequisites: Earth Sciences 231*, 241*
2 lectures, 3 hours laboratory, Winter term

333* Sedimentology 1
2 lectures, 3 hours laboratory, Winter term

336* Paleontology
Advanced paleontology emphasizing morphology, classification, evolution, paleoecology and stratigraphic value of fossil invertebrates. Field trips and laboratory study of fossil collections.
Prerequisites: Earth Sciences 236*
2 lectures, 2 hours laboratory, Fall term

342* Geomorphology
2 lectures, 3 hours laboratory, Fall term

345* Historical Geology
A systematic review of the geological history of North America from the Precambrian to Recent exemplified by regional geology. Laboratory work will include study of rock and fossil regional suites and geological maps.
Prerequisite: Earth Sciences 235*
2 lectures, 2 hours laboratory, Winter term

355* Mathematical Geology 1
Introduction to the principles of probability and statistics and their application in the Earth Sciences. Evaluation of quantitative data; statistical models.
Prerequisites: Mathematics 130 and an introductory course in computer programming
3 lectures, Fall term

360* Introduction to Applied Geophysics
An introduction to applied geophysics, covering seismic, gravity, electric, electromagnetic, magnetic, radiometric and borehole logging methods.
Prerequisite: Physics 101*-102* or consent of instructor
3 lectures, 2 hours laboratory, Fall term

368* Geophysics 1
Prerequisite: Mathematics 130, Physics 121*-122* or equivalent
2 lectures, Fall term

369* Geophysics 2
The geology of the ocean basins. Topics in physical oceanography. Physical properties of ocean water, heat budget of the world oceans. Oceanic circulation, Coriolis effects. Some idealized current regimes.
(Identical to Physics 369*)
Prerequisite: Earth Sciences 368*
2 lectures, Winter term
370* Geology of Non-renewable Primary Resources
The occurrence and geological setting of metallic, non-metallic minerals and construction materials. Energy resources. Special emphasis on Canada's resource industry. The laboratory will involve sampling methods, ore calculation and property evaluation. 
Prerequisites: Earth Sciences 231*, 241*
3 lectures, 2 hours laboratory, Winter term

421* Geochemistry 2
An introduction to geochemical processes in the Earth's crust with special emphasis on low temperature environments. Fundamental principles are reviewed and applied to the understanding of sedimentary rocks, the hydrosphere and hydrothermal systems.
Prerequisite: First year Chemistry, Earth Sciences 221*
3 lectures, 2 hour laboratory, Fall term

427* Crustal Evolution
Continental drift, sea-floor spreading, plate tectonics, Paleoclimates and paleogeography with particular reference to the Phanerozoic record.
2 lectures, 2 hours seminars, Winter term

432* Precambrian Geology
The geology, tectonics, stratigraphy and history of the Canadian Precambrian Shield. The Precambrian time scale and problems of geochronology. Life, climate and physical conditions in Precambrian time.
2 lectures, 2 hours laboratory, Winter term

433* Sedimentology 2
Prerequisite: Earth Sciences 333*
2 lectures, 3 hours laboratory, Winter term

434* Biostratigraphy
Methods to 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. 
Prerequisite: Earth Sciences 336* or 336*
2 lectures, 2 hours laboratory/seminar, Fall term

435* 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. 
Prerequisite: Earth Sciences 260*
3 lectures, 2 hours laboratory, Fall term

436 Honours Thesis
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.

438* Engineering Geology
The application of geology to civil engineering problems. Introductory soil and rock mechanics. Urban and environmental geology.
2 lectures, 1 hour problems, Winter term

439* Groundwater Geology
Groundwater hydrology. The location, exploitation, and conservation of groundwater resources, physical and chemical interaction of water with subsurface geologic materials, relations between groundwater and surface water regimes.
3 lectures, Fall term

440* Quaternary Geology
Stratigraphy and history of Quaternary Period with emphasis on glaciation. Laboratory studies on glacial deposits. Field trips. A previous course in geomorphology is recommended.
2 lectures, 3 hours laboratory, Fall term

456* Mathematical Geology 2
Boundary value problems in geophysics and hydrogeology. Mathematical modelling of geological systems; simulation. 
Prerequisites: Earth Sciences 355*, Mathematics 130
3 lectures, Winter term

461* Applied Geophysics
Physical and mathematical foundations of applied geophysics, advanced methods of treatment of geophysical data, with emphasis on problems from geophysical exploration. 
Prerequisite: Earth Sciences 360*
2 lectures, 2 hours laboratory, Winter term
470* 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 practise in ore microscopy.
Prerequisites: Earth Sciences 231*, 241*, 370*
3 lectures, 2 hours laboratory, Fall term
Department of Economics

Associate Professor, Chairman of the Department
R.R. Kerton, B.Comm.(Toronto), M.A.(Carleton), Ph.D.(Duke)

Assistant Professor, Associate Chairman
A. Olsen, B.Comm.(Sir George Williams), M.B.A. (Western Ontario)

Associate Professor, Graduate Officer
W.R. Needham, B.Comm.(Carleton), M.A., Ph.D. (Queen's)

Assistant Professor, Undergraduate Officer
K.M.H. Bennett, B.A., M.A.(Queen's), Ph.D.(McGill)

Professors
J.H. Hotson, B.A.(Colorado College), M.A., Ph.D. (Penn)
A. Koutsoyiannis, B.A.(Athens), Ph.D.(Manchester) visiting 1974
B. Thomas, Ph.D.(London), C.B.E., F.B.A. visiting 1975-76
V.C. Walsh, B.A., M.A., Ph.D.(Trinity College, Dublin)

Associate Professors
L.P. Fletcher, B.Comm(Mount Allison), A.M., Ph.D.(Brown)
S.K. Ghosh, B.S., M.S.(Calcutta), M.A., Ph.D. (Wisconsin)
G. Lermer, B.Sc (M.I.T.), M.A., Ph.D.(McGill)

Assistant Professors
A. Andrikopoulos, B.A.(Athens), M.A.(Wayne State), Ph.D.(Southern California)
S.W. Kardasz, B.A.(Loyola)
M. Loken, B.A.(Concordia), M.A.(Calgary), Ph.D. (Duke)
E. Milne, B.A. (Windsor), M.A., Ph.D.(Northernwestern)
G. Russell, B.Comm., M.B.A.(McMaster), R.I.A.
J. Schwartz, B.C.E., M.S., Ph.D. (M.I.T.)

Lecturers
S. Shinohara, B.A.(Tokyo), M.A.(Chicago) (part-time)
K. Stollery, B.A.(Southern California), M.A.(Queen's)
R.M. Blair, B.Eng., M.B.A.(Queen's), C.A. (part-time)
J.D. Cianci, B.A.(U.B.C.) (part-time)
R. Killinik, B.A.(Waterloo), M.B.A.(McMaster) (part-time)
J. Mackey, B.A.(Guelph), M.B.A.(McMaster) (part-time)

Associated Faculty

Professors
G. Berman, Ph.D.(Toronto), Chairman Department of Combinatorics and Optimization
D.A.Sprott, Ph.D.(Toronto), Chairman, Department of Statistics

Associate Professor
D.W. Conrath, B.A., M.S.(Stanford), M.A., Ph.D. (U.C. at Berkeley) Department of Management Sciences

Undergraduate Course Descriptions

Economics 101*, 102* comprise the regular sequence of courses in introductory economics for students majoring in this field, and for other students who plan to do additional work in economics. Students proceeding to a General Arts degree with a major in Economics are required to take as part of their programme Economics 201*, 202*, 231* plus either 211* or 221* and at least four half courses in Economics at the 300 level or above. It should be noted that some of the 400 level courses are open to third year students who have the necessary pre-requisites (this also holds for second year students with respect to 300 level courses).

The number of courses offered in a particular year will not necessarily include all of those listed below.

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.

101* 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 and pricing of national output, pricing of productive factors, and income distribution.

102* Introduction to Macroeconomics
Determination of national income; the banking system; government fiscal and monetary policy; international trade and finance; and current economic problems.

Fall and Winter terms
Early in the Fall term the Department of Economics administers a test in Economics 101*/102* for students who have completed Economics in Year 5. Any student who scores at least 70 per cent in the test will be exempted from Econ. 101*/102* and may register for Econ. 201*/202*.

191* Introduction to Financial Accounting 1
Recording transactions; measuring income; preparation and analysis of financial statements; accounting for assets, liabilities, and owner equity.
2 lectures, 2 hours laboratory
Fall and Winter terms

192* 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.
Prerequisite: Economics 191*
2 lectures, 2 hours laboratory
Fall and Winter terms

Early in the Fall term the Department of Economics administers a test in Economics 191*/192* for students who have completed Accounting in Year 5. Any student who scores at least 70 per cent in the test will be exempted from Econ. 191*/192* and may register for Econ. 291*/292*.

193*/194* 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.
Fall and Winter terms

201* Microeconomic Theory
Theory of consumer demand; production theory; market structure; resource pricing and allocation under perfect and imperfect competition.
Prerequisite: Economics 101*
Fall and Winter terms

202* Macroeconomic Theory
Theory of the determination of the level of national income, employment and the price level.
Prerequisite: Economics 102*
Fall and Winter terms

211* Mathematics for Economists
Application of elementary mathematics to problems in economic theory. Topics include the graphing of functions, elementary analytical geometry, derivation, exponential and logarithmic functions and differentiation—all developed within the context of economic theory.
Prerequisites: Economics 101*, 102*
Fall and Winter terms

221* 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.
Prerequisites: Economics 101*, 102*
Fall and Winter terms

231* 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.
Prerequisites: Economics 101*, 102*
Fall and Winter terms

233* Regional Economics
Application of economic theory to the analysis of regional economic problems, including, for example, the problem of chronically depressed areas, and of regions whose economic activity is concentrated in one or two major industries.
Prerequisite: Economics 201*
Winter term

241* 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.
Prerequisite: Economics 201*
Winter term

261* World Economic History
Selected topics in the economic development of various areas of the world. Emphasis is given to the nature and origin of the forces which gave rise to particular methods of economic organization and institutions.
Prerequisites: Economics 101*, 102*
Fall term
## Course Descriptions

### Economics

### Department of Economics: Course Offerings

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263* Economic History of Canada
The course concentrates first on Mercantilist theory and practice vis-a-vis Canadian development, then turns to Innis' "Staples Theory". Finally, modern economic theory is used to analyse a number of controversies in Canadian economic history, in particular the rejection of the staples model by Chambers and Gordon and the dispute regarding the economic impact of the Reciprocity Treaty of 1854. The relation between these historical controversies and current concern about Canadians "selling-off their heritage" will conclude the course.
Prerequisites: Economics 101*, 102*
Winter term

291*/292 Intermediate Financial Accounting 1, 2
An in-depth analysis of accounting procedures. A study is made of the reporting process, matching of costs and revenues, money value items, capital determination and presentation, and accounting for internal management.
Prerequisites: Economics 191*, 192*
Fall and Winter term

293* 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.
Prerequisites: Economics 191*, 192*

301* Intermediate Microeconomics
Distribution theory; production, consumption and general equilibrium analysis; welfare economics.
Prerequisite: Economics 201*, 231*
Fall term

302* 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.
Prerequisites: Economics 202*, 231*
Winter term

303* Economic Thought
A critical survey of the development of economic thought from Adam Smith through J.M. Keynes.
Prerequisites: Economics 201*, 202*, 231*

311* 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.
Prerequisites: Economics 201*, 202*; 211* (or Math 130)

321* Introduction to Econometrics
Introductory level course in econometrics; includes economic model building and testing, regression and correlation analysis, and price indices.
Prerequisite: Economics 221*

331* 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.
Prerequisites: Economics 201*, 231*
Fall term

332* International Monetary Theory
The monetary aspect of international economic relations. Topics include analyses of the foreign exchange and international capital markets, the theory of balance of payments policy, monetary integration, and reform of the international monetary system.
Prerequisites: Economics 202*, 231*
Winter term

333* Interregional Economics
Application of economic theory to the analysis of interregional economic problems. Emphasis is on the use of elementary models of international trade to analyse interregional economic relations.
Prerequisites: Economics 201*, 231*, (Economics 233* is recommended)

335* Economic Development
The nature of the problem of economic development; theories of economic development; major policy issues in economic development.
Prerequisites: Economics 201*, 202*, 231*

341* Public Finance
The economic rationale of governmental activity; alternative measures of fiscal operations; the structure and economic effects of government revenues and expenditures; the role of fiscal policy in economic stabilization and growth.
Prerequisite: Economics 201*
343* Urban Economics
Application of economic analysis to location decisions of firms and households; discussion of policy problems, for example, urban renewal and housing. 
Prerequisite: Economics 101* (Economics 201* is recommended)

345* 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. 
Prerequisite: Economics 201*

347* Economics of Transportation and Communication
Application of economic analysis to problems in the area of transportation and communication; critical review of policies and programmes designed to deal with problems in this area. 
Prerequisite: Economics 201*

351* Labour Economics
Wage theory, training and mobility theory; economics of information in Canadian labour markets; other investments in human capital; manpower policies. 
Prerequisite: Economics 201*

353* Population Economics
Demographic techniques; economic interrelationships with fertility, mortality, morbidity; theory of an optimum population. 
Prerequisite: Economics 201*

355* 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. 
Prerequisite: Economics 201* (Economics 241* is recommended)

357* 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. 
Prerequisite: Economics 201*

361* North American Economic History
An advanced level treatment of the economic development of North America with particular emphasis given to various facets of the economic interrelationship between Canada and the United States. 
Prerequisite: Economics 201*

363*/364* Contemporary Canadian Problems 1, 2
A "topic oriented" seminar course. The class agrees to study a Canadian problem selected from a list that includes poverty, unemployment, industrial policy, and so forth. The format assists the student in gaining analytical skill through work on the selected topic. 
Prerequisite: Economics 201*, 202* 
Fall and Winter terms

381*-389* Special Topics
One or more special half courses will be offered at different times as announced by the Department. 
Prerequisite: Consent of Instructor

391*/392 Cost and Management Accounting 1, 2
Conventional methods of accounting, summarizing, and interpreting costs; job order and process costing. Budgetary control with standard costs; profit analysis for decision-making purposes. 
Prerequisite: Economics 192* 
Fall and Winter term

393*/394* Corporate Finance 1, 2
The general problem of financing business activities; the financial organization and control of corporations, liquidations and reorganization; the operation of capital markets. 
Prerequisite: Economics 101*, 102*, 191*, 192* 
Fall and Winter terms

401* Advanced Economic Theory
Pure theory of exchange, production and consumption theory, the core of an economy, capital theory, general equilibrium analysis of multiple markets, and related theoretical issues. 
Prerequisite: Economics 301*, 302*, fourth-year standing 
Fall term

402* Economic Cycles and Stabilization Policy
Theory of economic policy, business cycles, inflation and unemployment problems, and balance of payments analysis. 
Prerequisites: Economics 301*, 302*, Fourth-year standing 
Winter term

403* 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. 
Prerequisites: Economics 301*, 302*
411* Mathematical Economics
Mathematical formulation of economic theory; solutions to systems of simultaneous difference and differential equations; introduction to dynamic models; analysis of stability conditions; introduction to linear and nonlinear programming, input-output analysis, game theory.
Prerequisites: Economics 301*, 302* 311*
Fall term

413* 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.
Prerequisites: Economics 301*, 302*, 311*
Winter term

421*/422* Econometrics 1, 2
Review of linear algebra, and development of basic statistical inference; formulation, identification, estimation, and tests of single equation and simultaneous equation regression models of micro- and macroeconomics; empirical models.
Prerequisites: Economics 201*, 202*, 211*, 221*, 321*
Fall and Winter terms

431* Advanced International Economics
Analysis of selected topics such as the theory of trade blocs and systems of customs unions, economic integration, devaluation theory, theory of dominant currencies, international transmission of inflation, gold/bimetalic/dollar standard theories and optimum currency areas.
Prerequisites: Economics 301*, 302*, 331*, 332*
Fall term

432* International Economic Policy
Analysis of selected policy problems, such as monetary and fiscal policy mix in open economies, optimum tariff policy, trade and environmental policies, trade in public goods and bads, international monetary reform, control of international capital flows, the multi-national firm, and so forth.
Prerequisites: Economics 301*, 302*, 331*, 332*
Winter term

441* Economics of the Public Sector 1
An overview of fiscal functions and institutions; the theory of social goods; expenditure and revenue structures; fiscal incidence.
Prerequisites: Economics 231*, 301*, 302*, 341*
Fall term

Economics

442* Economics of the Public Sector 2
Fiscal stabilization, fiscal federalism, public pricing, international public finance, social security and other contemporary policy issues.
Prerequisite: Economics 441*
Winter term

451* Advanced Topics in Resource Economics
Advanced analysis of selected topics in the area of energy, land, and labour resources.
Prerequisites: Economics 201*, 202*, 231* 355*

461* Comparative Economic Systems
An analysis of the government's role in the planning and management of the economy under capitalism, socialism, fascism, communism, worker management, and other forms of economic organization.
Prerequisites: Economics 201*, 202*

481*-489* Special Studies
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor

491* Advanced Accounting 1
The accounting treatment of business combinations, consolidations, pooling of interests, reorganizations, valuation of business enterprises, foreign branches, specialized types of operations such as mutual funds, banks, trust companies, insurance companies, municipalities, non-profit institutions.
Prerequisites: Economics 391*, 392*

492* Advanced Accounting 2
Prerequisite: Economics 491*

493* Taxation
The prime purpose of the course is to gain a broad understanding of the Canadian tax system in its economic, legal, and accounting settings. Fundamental legal and economic concepts will be studied as well as specific provisions and problems that commonly arise. The second purpose of the course is to relate the provisions of the taxing statutes to frequent business problems with emphasis on tax planning.
Prerequisite: Economics 292*
Course Descriptions
Electrical Engineering

Department of Electrical Engineering

Professor, Chairman
K.D. Srivastava, B.Sc., B.E.(Hons.) (Roorkee), Ph.D.(Glasgow)

Professor, Associate Chairman (Graduate Studies)
R.H. MacPhie, B.A.Sc.(Toronto), M.S., Ph.D.(Illinois)

Associate Professor, Associate Chairman (Undergraduate Studies)
J.V. Hanson, B.A.Sc.(Toronto), M.Sc., Ph.D. (Imperial College, London)

Professor, Dean of Graduate Studies
L.A.K. Watt, B.Sc.(Manitoba), M.S.(Chicago), Ph.D.(Minnesota)

Professors
J.H. Anderson, B.Sc.(Leeds), M.Sc., Ph.D.(Manchester)
R.G. Anthes, B.A.Sc., M.A.Sc.(Toronto)
R.R. Bryant, M.Sc.(London), M.A., Ph.D.(Cambridge)
E.L. Heasell, B.Sc., Ph.D.(Imperial College, London)
S.N. Kalra, B.Sc.(Punjab), M.S., Ph.D.(Illinois)
H.C. Ratz, B.A.Sc.(Toronto), S.M.(M.I.T.), Ph.D. (Saskatchewan)
J. Reeve, B.Sc., M.Sc., Ph.D.(Manchester)
J. Vlach, Dipl. Ing., C.Sc.(Technical Univ. of Prague)
L.Y. Wei, B.S.(National Northwestern College, China), M.Sc., Ph.D.(Illinois)

Associate Professors
J.D. Aplevich, B.E.(Saskatchewan), Ph.D.(Imperial College, London)
I.F. Blake, B.Sc., M.Sc.(Queen's), M.A., Ph.D. (Princeton)
S.G. Chamberlain, M.Sc., Ph.D.(Southampton)
Y.L. Chow, B.Eng.(McGill), M.A.Sc., Ph.D (Toronto)
J.D. Cross, B.Sc.(Cardiff), M.Sc., Ph.D.(Carleton)
G.J. Dufault, B.A.(Ottawa), B.Sc(Carleton)
J.A. Field, B.E.(Saskatchewan), M.A.Sc., Ph.D. (Toronto)
J.S. Keeler, B.A.Sc., M.A.Sc.(Toronto)
W.D. Little, B.A.Sc., M.A.Sc., Ph.D. (U.B.C.)
J.C. Majithia, B.Sc.(London), M.Eng., Ph.D. (McMaster)
J.W. Mark, B.A.Sc.(Toronto), M.Eng., Ph.D. (McMaster)
W.N. Meikle, B.A.Sc., M.A.Sc.(Toronto)
R.S. Ramshaw, R.Sc., Ph.D.(Nottingham)
B. Stott, B.Sc., M.Sc., Ph.D. (Manchester)
R.G. van Heeswijk, Dipl.Eng.(Delft), Holland

Assistant Professors
M.I. Elmasry, B.Sc.(Cairo), M.A.Sc., Ph.D.(Ottawa)
K. Kameda, B.S, M.S(Tokyo), Ph.D.(Princeton)
V.H. Quintana, I.I.E.(Chile), M.Sc.(Wisconsin), Ph.D.(Toronto)
P.A. Vuorinen, B.A.Sc.(Toronto), Ph.D.(London)
W.J. Wilson, B.E., M.Sc.(Saskatchewan), Ph.D. (Cambridge)

Research Assistant Professors
H.C. Card, B.Sc., M.Sc.(Manitoba), Ph.D.(Manchester)
V.M. Raina, B.Eng.(Kashmir), M.Eng.(Roorkee), Ph.D.(Waterloo)

Visiting Professor
F.H. Branim, B.A.(Wesleyan), M.A., Ph.D.(Princeton) Sept./73 – Aug. 31/75

Laboratory Director
R.L. Wright, P.Eng.

Undergraduate Programme

Details of the undergraduate programme in Electrical Engineering may be found on page 117. Each course extends over one term only.

Undergraduate Course Descriptions

14 Electromagnetics
Kirchoff's Laws, mesh current and node voltage equations, super-position theorem, maximum power theorem, time domain analysis of RC, RL and RLC circuits, phasors, measuring instruments, power factor and its correction, magnetic circuits, transformers, electromechanical energy transducers, introduction to d.c. and a.c. motors and generators, polyphase circuits.
Prerequisites: GE112, Math 12, Math 21, or equivalent

32 Electronic Instrumentation
Introduction to the principles of instrumentation; transducers, amplifiers and readouts. Realization of these with emphasis on solid state electronic devices and circuits. The control of electric power with semiconductor devices.
Prerequisites: EE14 or equivalent

201 Seminar
General Seminar
202 Seminar
General Seminar

203 Concepts in Electrical Engineering
A series of lectures by the E.E. Faculty and invited speakers surveying the areas of networks, devices, electronics, communications, computers, power, control, antennas, microwaves.

205 (Math 25) Advanced Calculus for Electrical Engineers 1
Differential calculus of functions of several variables. Differential equations, Multiple integrals. Applications to Electrical Engineering will be stressed.

206 (Math 35) Advanced Calculus for Electrical Engineers 2
Fourier series, partial differential equations, separation of variables, wave equations, heat equation and Laplace's equation, Fourier integral, properties of complex analytic functions, complex integration. Applications to Electrical Engineering problems will be stressed.

221 Principles of Digital Logic Circuits

233 Physical Electronics
Electromagnetic radiation, photoelectric effect, Compton effect; Wave aspects of particles; Structures of hydrogen atom; many electron atoms; Solid State Physics, semiconductors, effective mass n and p-type materials, Fermi levels, mass action law, charge neutrality, conductivity, mobility, diffusion; Introduction to p-n junctions.

241 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. 
Prerequisites: GE122, M12, GE121

261 Energy Processing & Conversion
Prerequisites: EE241, or equivalent

271 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. Prerequisites: GE122 or equivalent

293 Measurement and Instrumentation 1
Safety in the laboratory, measurement errors, accuracy. The oscilloscope, d'Arsonval meters, rms and mean values, ac measurements, electrodynamometer instruments, bridges, the decibel, signal sources, transducers. Laboratory experiments.

294 Measurement and Instrumentation 2
A continuation of EE293; to include topics from: digital instruments, sampling oscilloscope, spectrum analysis, design of experiments, data handling, experimental technique; laboratory experiments.

301 Seminar
General Seminar.

302 Seminar
General Seminar.

316 Probability and Statistics
Basic notions of probability; conditional probability and independence; Bayes' Theorem; random variables; functions of random variables; and distribution functions; applications to reliability and failure rates; two dimensional random variables; marginal and conditional distributions and transformation of variables; correlation and applications to regression and statistical testing. Prerequisites: EE205 (Math 25) or equivalent

317 Signal Analysis Methods
Fourier series, periodic functions; Fourier transforms, non-periodic functions; The discrete Fourier transform, discrete time sequences; the Z transform, discrete time systems. Prerequisites: EE206 (Math 35) or equivalent


Course Descriptions

Electrical Engineering

324 Introduction to Digital Circuits and Computers
Prerequisites: EE221 or equivalent

342 Electric Networks 2
Review of sinusoidal steady state, node and mesh analysis; source transformations, Laplace transforms and applications; network functions; network theorems; two-ports; network graphs and Tellegen's theorem; state equations.
Prerequisites: EE241 or equivalent

351 Electronics 1
Review of doped semiconductors, charge neutrality, mass action law, equilibrium conditions. Boltzman relations; derivation of p-n junction, d.c. and a.c. characteristics; charge storage effects; the bipolar transistor; derivation of d.c. and a.c. terminal characteristics, small and large signal models. Temperature effects. Introduction to the insulated gate field effect transistor. (MOSFET).
Prerequisites: EE233 or equivalent

352 Electronics 2
Large signal amplifiers; biasing networks and stability; single and multi-stage small-signal amplifiers; the hybrid-pi model; high and low frequency cut-off effects; feedback amplifiers; stability; oscillators; noise in electronic circuits; modulation and detection systems.
Prerequisites: EE351 or equivalent

362 Dynamic Energy Conversion
Energy conversion by use of dynamic magnetic circuits. Translational and rotational transducers used in the electrical-mechanical energy conversion process.
Prerequisites: EE261 or equivalent

372 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.
Prerequisites: EE271 or equivalent

380 Introduction to Systems and Control
Mathematical modelling of systems and components; introduction to simulation; characteristics of feedback systems; signal flow graphs; frequency response; system stability by Routh-Hurwitz criterion, Nyquist plot and Root Locus techniques.

401 Seminar
General Seminar

402 Seminar
General Seminar

417 Numerical Methods
Prerequisites: GE121, EE205 (Math 25) or equivalent

425 System Simulation
A study of computer simulation techniques; principles of analog computation; models, scaling and procedures; digital simulation languages, computer simulation and investigation of continuous systems; differential equations, transfer functions, boundary value problems, system design; elements and application of hybrid computers.

426 Software Engineering
Programming techniques, including subroutines, recursive programs etc. Arrays, lists, pushdown stacks. Searching and sorting methods. Assemblers, compilers and interpreters. Operating system, resource management, time-sharing. Communication between computers.
Prerequisites: EE324 or equivalent

427 Computer Hardware Design
Prerequisites EE324, or equivalent
428 Signal Analysis and Frequency Domain Methods
Introduction to Fourier Series and Transforms and their use in the analysis of deterministic signals in linear systems; bandwidth, distortion and filter characteristics; input output relationships in linear filters; linear modulation such as AM, SSB, VSB and demodulation techniques; sources of noise in a communication system including channel and receiver noise.
Prerequisites: EE205, M25 or equivalent

429 Communication Systems
Probability theory and the description of random processes, the analysis of analog and digital communication systems including phase and frequency modulation of analog waveforms and pulse amplitude modulation, pulse code modulation for digital signals; the investigation of the performance of these systems in the presence of noise using various criteria, including probability of error and signal to noise ratios.
Prerequisites: EE316, EE428 or equivalent

434 Quantum Electronics and Magnetics
Laser principles, solid state lasers, semiconductor injection lasers, gas lasers, laser applications, holography. Ferromagnetism, spin waves, magnetic domains, diamagnetism and paramagnetism, electronic spin resonance, magnetic memories, bubble devices.
Prerequisites: EE271, EE351 or equivalent

435 Semiconductor Devices 1
Relaxation times, scattering mechanisms, ionisation rates, avalanche and Zener breakdown, recombination models, Review of p-n junction theory. Selected topics from: Photo devices, solar cells, Silicon controlled rectifiers, microwave devices, Schottky, varactor or light emitting diodes, junction field-effect devices.
Prerequisites: EE351 or equivalent

436 Semiconductor Devices 2
Integrated Circuits; Techniques for the design and realization of integrated circuit elements: Resistors, capacitors, diodes, active devices. Simple models for bipolar and MOSFET. Current sources, d.c. level shifting, I.C. biasing, differential and output stages. Design and analysis of logic circuit elements and logic implementation: MOSFET and COSMOS, CMOS, DCTL, DTL, T'L, HTL and ECL principles. Flip-flops, trigger, comparator, counter and clock circuits. Large scale integration: Active memories, RAM, ROM, shift registers.
Prerequisites: EE352 or equivalent

443 Electric Networks 3
Topics from the following: general passive network functions; passive driving point functions; reactance functions and reactance networks; scattering parameters, reactive passive filters; active networks and active filters, digital filters.
Prerequisites: EE342 or equivalent

446 Algebra of Linear Systems
Continuous and discrete linear systems; linear transformations; finite field theory; polynomials over finite fields; matrix algebra, system decomposition.
Prerequisites: EE380 or equivalent

453 General Electronic Circuits
Selected topics from the following: Applications of the MOST and JFET to modern circuits. Bipolar IC's. Design of operational amplifiers, IC temperature compensation. Power supplies, narrow and wideband amplifiers, the cascode amplifier. Differential, low noise amplifiers, frequency response, power amplifiers. Modulators, mixers, detector circuits, receiver front end design.
Prerequisites: EE325 or equivalent

454 Pulse and Switching Circuits
Selected topics from the following: switching characteristics of semiconductor devices, non-sinusoidal wave generation and shaping, voltage and current sweeps, binary circuits, NAND, NOR, AND, OR gates and compatibility requirements, digital integrated circuits, DTL, DCTL, ECL, and T'L; the blocking oscillator.
Prerequisites: EE351, EE352 or equivalent

459 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, and audio electronics.
Prerequisite: Knowledge of the basic techniques for measurement and analysis of simple linear systems is required. Familiarity with simple electronic devices would be helpful.

463 Energy Conversion and Power Applications
The steady state control of electrical machines; thyristors for power applications; steady state control of apparatus by power electronics; transient response of electromechanical translational transducers; introduction to dynamic circuit theory for the transient analysis of individual rotating transducers; protection of plant, power generation, hydro, steam, tidal, nuclear, etc., super conductivity and power applications.
Prerequisites: EE261, EE362 or equivalent
464 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. 
Prerequisite: EE463 or equivalent

465 Power Systems
Introduction to system concepts of power plants; coordinate systems including symmetrical components; sequence impedances and transmission line constants; analysis of unbalanced systems and fault calculations; per-unit systems; protection techniques and fault analysis appropriate to protection; voltage and reactive power control; power transfer and system stability; load flow; introduction to computer methods for power systems analysis; transient response of power systems; introduction to HVdc transmission; economic considerations.

473 Microwave Engineering
Rectangular and circular waveguides; simple waveguide discontinuity; periodic transmission systems: microwave scattering theory; ferrite components; klystrons; travelling wave amplifiers; backward-wave oscillator, magnetron; solid-state microwave devices.
Prerequisite: EE372 or equivalent

474 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, ionospheric propagation, plasmas.
Prerequisites: EE372 or equivalent

481 Control Systems
Performance specification, synthesis of single-input single output system; state variable representation for continuous and discrete time systems; analysis of multivariable systems.
Prerequisites: EE380 or equivalent

482 Control Systems 2

499A, 499B 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.
Department of English

Professor, Chairman of the Department
W.U. Ober, B.A.(Washington and Lee), Ph.D. (Indiana)

Professors
J. Gold, B.A.(Birmingham), Ph.D.(Wisconsin)
J.C. Gray, B.A.(Washington State), M.A.(Connecticut), Ph.D.(Syracuse)
G.R. Hibbard, B.A., M.A.(London)
K. Ledbetter, A.B.(Central College, Mo.), M.A., Ph.D.(Illinois)
C.F. MacRae, B.A.(Western), M.A.(McMaster), Ph.D.(Toronto)
W.R. Martin, M.A., D.Litt. et Phil.(South Africa)
W.K. Thomas, M.A., Ph.D.(Toronto)

Associate Professors
A.I. Dust, M.A., Ph.D.(Illinois)
B.N. Honeyford, B.A., Ph.D.(Toronto)
H.E. Haworth, B.A.(Rollins), M.A., Ph.D.(Illinois)
P.M. Hinchcliffe, B.R.(British Columbia), M.A., Ph.D.(Toronto)
N.C. Hultin, B.A.(Concordia), M.A.(Chicago), Ph.D.(Johns Hopkins)
R.M. Levitsky, B.S.Ed.(Central Missouri S.C.), M.S.Ed.(Illinois Normal), Ph.D.(Missouri)
H.M. Logan, A.B.(Franklin and Marshall), Ph.D. (Pennsylvania)
G.E. Slethaug, B.A.(Pacific Lutheran), M.A. Ph.D. (Nebraska)
J.S. Stone, M.A.(British Columbia)
H. Tuyn, M.A.(Utrecht and Oxon.), Docteur de l'Universite de Paris R

Assistant Professors
P.D. Beam, B.A.(Waterloo), M.A.(McMaster), Ph.D. (Toronto)
R.R. Dubinski, B.A., M.A.(Western), Ph.D.(Toronto)
R.N. Gosseink, B.A.(Kansas), M.A., Ph.D.(Colorado)
D.S. Keppel-Jones, B.A.(Natal) M.A., Ph.D. (Queen's)
R. Lister, B.A., M.A., Ph.D.(Toronto)
W.R. MacNaughton, B.A.(Toronto), M.A., Ph.D. (Wisconsin)
E.P. McCormack, M.A.(Glasgow), Ph.D.(Manitoba)
J.S. North, B.A., M.A.(British Columbia), Ph.D. (Alberta)
Sister M. Leon, S.S.N.D., B.A.(Toronto), M.A. (Detroit) (part-time)
D.R. Letson, B.A.(Waterloo), M.A.(McMaster), Ph.D.(Toronto) (part-time)
M.G. Thysell, M.A.(Montana), Ph.D.(Iowa) (part-time)

Lecturers
L. Dorney, B.A., M.A.(Louisville) I
(part-time)
S.E. McMullin, B.A., M.A.(Carleton)

For programmes and courses in Drama, see Drama and Theatre Arts Group in this Chapter.

English Honours Programmes

For programmes in Honours English and dual Honours programmes involving English, see page 91.

English General Programme

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

First Year

Either English 101 or 102 is the recommended first-year course. However, a first year student may – without formal permission from the Department – take courses from the following list instead of either 101 or 102: English 108*, 190*, 211*-212*, and 230*-231*. All other English courses are open to first-year students, but only with the permission of the Chairman of the English Department and the instructor of the course. Students may use only one full course equivalent in English from the 100-level to fulfill the minimum English requirements.

Upper Years

English 251 is strongly recommended for second year. With the consent of the Department upper-year courses may be taken at any time during the upper years without regard to course number or "level".

Restrictions

English 109*, 140*-141*, 209*, 210*, 245R and 335 may not be included as approved English courses in fulfilling the minimum course requirements for an English Programme, but may be chosen as non-English electives.

Note 1

W.K. Thomas's Correct Form in Essay Writing is the official style sheet for all undergraduate English courses.
Note 2
The “normal” number of lectures per week in each course is three; however, each instructor determines how often his particular class will meet.

Note 3
In all English courses, emphasis will be placed on student essays written in connection with the reading.

Undergraduate Course Descriptions

10 English as a Second Language
(a non-credit course)
The course will aim at the improvement of both written and spoken English to bring about ease and facility of expression in assignments and oral discussion through a detailed study of basic patterns in Grammar and Idiom and their practical application in writing commentaries, essays or summaries.

101 The Living Tradition
An examination of examples of the greatest literature in English and its relation to the periods of its origin. Figures such as Chaucer, Shakespeare, Milton, Swift, Blake, Keats, Tennyson, Dickens, and T.S. Eliot will be examined. The precise list of readings will depend upon the individual instructor. The basic text will be the one-volume Norton Anthology of English Literature.

102 Poem, Play and Story
A study of the forms that imaginative literature assumes. Examples of different kinds of literature will be explored in detail so as to discover how the shape of a literary work of art contributes to its meaning. Students will for instance read ballad, lyric, and narrative poetry; classic tragedy and comedy and absurdist, existential and expressionist plays; novels and short stories.

108* Themes of Literature
An exploration of the great variety of literature through thematic perspectives. The following themes will be offered in the coming year:

108*A The Hero
A study of human excellence in thought and action, embodied in representative men and women, as seen through works of literature.

108*B Utopia and Anti-Utopia
The purpose of this course will be to acquaint the student with various forms of the literary artist’s moral vision of man as it appears in “Utopian” writings. It will involve an examination of the role of the imagination in helping to inform and embody the cultural ideals of various periods.

108*C Literature and Morality
Works in English literature from its beginnings are selected for their bearings on questions of morality.

108*E Women in Literature
A study of the nature and role of women in British, Canadian, and American literature from Chaucer to the present. Works by both men and women writers will be studied in which women are seen in such forms as earth mothers, people, sex objects, and bitches.

108*F The Rebel
A study of various works of literature in which the protagonist is a rebel, a non-conformist to the standardized, existing norms of life and living. It will examine a number of rebel types and concepts, moral implications and final outcomes either in successful realization or in tragic defeat.

108*H Isolation and Alienation
This course includes the study of a variety of works of literature 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 inner struggle isolates him from society and alienates him from his fellow man. The course will discuss the process in which wisdom and maturity are gained as the ultimate product of suffering.

109* Basic Writing Skills
This course is designed for students who wish to develop basic writing skills. It teaches such elements of composition as focus of theme and development of central idea, use of supporting material, and organization; it stresses as well proper mechanics and good diction. The course takes the student from the paragraph to the essay, and from exposition to argumentation. Essays written will not be lengthy, but they will be frequent.

140* 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.

141* The Use of English 2
A continuation of English 140*. The study of factual, emotive, scientific and imaginative writing: relevance, context; meaning, tone, feeling and intention.

Prerequisite: English 140*
190* Shakespeare  
Designed for students in all programmes and faculties, the course examines some of Shakespeare's comedies, history plays, and tragedies selected from his early, middle, and late periods. In addition, the full range of Shakespeare's variety and flexibility in developing characters and dramatic structures is stressed as are significant and recurring themes. No previous work in Shakespeare is required.

201* The Short Story (formerly English 105*)  
Examples are the stories of Hemingway, Faulkner, James, D.H. Lawrence, and modern Canadian writers.

202 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.

203* 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 earliest times to the present and from the various nations of the English-speaking world. Topics such as the following will be discussed: Oral literature and traditional cultures of the English world; problems in the creation, transmission, and alteration of oral literature; myth, legend, tale, and märchen.

204* Introduction to Folklore 2  
Similar to 203* but dealing with folk-drama, ballads, songs, riddles, chants, proverbs, and charms. Prerequisite: English 203* or consent of instructor

205R* The Canadian Short Story  
Exploration of the Canadian short story, from its beginnings—in the bush, in the north, on the land, in the small towns—through the struggles of an urbanizing society to the present. A course in the "fashions" of Canadian short story writing tracing changing modes and reference points. Students will be expected to work in some depth with individual authors.

Note  
R courses are those administered by Renison College.

206* The Art of the Essay  
Essays of current and recurrent interest will be read both for the ideas presented and for the artistry involved in the presentation.

208* Literary Genres and Themes  
208A* Forms of Fantasy  
This course will deal with the history and forms of fantasy written for an adult reading audience. In considering fantasy as a 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 in depth.

208R* Science Fiction  
A discussion of the genre known as "science fiction," with some attention to its historical development. Various examples, drawn from Utopian and anti-Utopian science fiction, the aftermath of war, invasion from and to outer space, social science fiction, the nature of the individual, "gadget" science fiction, parapsychology, and alternate worlds and beings, will be considered.

208C* Studies in Children's Literature  
This course will deal with classic works of children's literature, including fantasy written primarily for children. Selections by such authors as Thackeray, Emily Bronte, Hawthorne, Kipling, Woolf, C.S. Lewis, George MacDonald, Kenneth Grahame, Welty, Thurber, and Langston Hughes will be studied.

208D* 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.

208E* 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. The emphasis of this course will be on the specific concerns of these writers with the situations and roles of women in the modern world, their search for new meanings and their innovations in literary forms.

208F* Themes in Canadian Literature  
The course will explore a theme which is significant in the understanding of the Canadian literary mind. Examples of themes which may be considered will include: the impact of the landscape, rural-urban conflict, isolation, social conservatism, regional reality. Novels, poetry, drama, essays and biography drawn from both 19th-century and 20th-century sources may be used.
208H* 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 roles of magic, Merlin and Wales, romance, and the Fellowship of the Round Table.

209* The Art of Writing Well
The course outlines the key principles of rhetoric and gives the student opportunities to apply them in the various forms of descriptive, expository, argumentative, and persuasive writing. There is one weekly lecture and a weekly workshop where student writing is discussed. Six to eight essays will be required.

210* Report Writing
The role of the report as a key tool in modern communications is examined as are its various forms and techniques. The student will practice writing many different kinds of reports.

211*/212* The Novel
The novel, by its nature, constitutes an attempt to formulate, to interpret, to reach for the significance of, the bewildering human experience. This course, in turn, undertakes an exploration of the various forms and manifestations that that attempt can take. British, Canadian, and American novels will be studied. The two halves of the course may be taken independently.

211* The Novel 1
A study of the novel in English from its beginnings to the late 19th century.

212* The Novel 2
A study of the novel in English from the later 19th century to the present.

230*/231* Poetry
A study of the major forms of poetry in the English language. Each half may be taken independently.

230* Narrative Poetry
A study of the major narrative forms in English poetry, including the ballad, epic, mock epic, and dramatic monologue.

231* 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.

232* The Development of Drama to 1660 (formerly English 361*)
A study of the origins and development of English drama, with special concentration on 16th-century non-Shakespearean drama.

233* Drama from 1660 (formerly English 364*)
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.

236* Literature of Ideas 1
This course is designed to stimulate oral and written controversy about such problems as idealism versus realism, the individual versus society, and rebellion versus revolution. Texts include classics such as Machiavelli's The Prince, More's Utopia, Marx's Communist Manifesto, and Mill's On Liberty, as well as 20th-century prose counterparts of these earlier works.

237* Literature of Ideas 2
Similar to English 236*, but dealing with moral implications of philosophical and scientific ideas and discoveries that have profoundly affected 20th-century society.

245R Form and Function
The uses of literacy and the functions of language as acquired in English 140*/141*. These will be applied to the more advanced form of the literary and critical assignment essay, involving comparison, evaluation and exposition.

Note
R courses are administered by Renison College.

251* The Theory and Practice of Criticism
A study of the elements of criticism and their application to a variety of literary texts and contexts. Much of the work of this course consists of analysis and discussion of literary problems by the students themselves.

290* 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.

291* Modern American Literature (formerly English 344*)
Approaches to reality amid the confusion and uncertainty of 20th-century America. Emphasis on such major writers as Faulkner, Miller, and Cummings.
Prerequisite: English 290*
305 Old English (formerly English 261)
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.

310 Middle English (formerly English 270)
A study of Middle English literature with special emphasis on the work of Chaucer.

312* 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.

313* Canadian Literature to 1920
A study of Canadian prose and verse to 1920, with particular attention given to the poetry of the School of the Sixties and to the historical and idyllic novels of the 19th and early 20th centuries.

314* Canadian Poetry Since 1920

315* 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.

316* Canadian Drama
A study of several plays by such dramatists as Merrill Denison, Robertson Davies, Gratien Gélinas (in translation), James Reaney, John Coulter, George Ryga and Michel Tremblay (in translation). The background for 20th-century Canadian drama will be provided by means of lectures.

330 Elizabethan Literature (excluding Drama)
(formerly English 280)
A study of the principal writers of prose and of lyric and narrative poetry in England during and immediately preceding the reign of Elizabeth I. Reserved for special attention is Spenser's epic poem glorifying Elizabeth I and England—The Faerie Queene.

335 Creative Writing
Aimed at encouraging the student to develop his creative and critical potentials, the course consists of supervised practice, tutorials, and seminar discussions. Enrolment is limited and, in order to be accepted, an applicant must first submit a manuscript as evidence of his ability to profit from the course.

339* Contemporary British Literature
A study of the major trends in British literature from World War II to the present. The course will examine the rise of the angry generation and social protest, the renaissance in drama, the return to tradition and the reaction against experimentation, and other topics related to the literary emergence of a new England.

345*(A-E) Studies in American Literature:
Themes
345B* The Southern Myth
The Southern Myth: its origins in early literature, its flowering, testing, and shattering; as in the works of Twain, Faulkner, Grau, and O'Connor, as in the black literature of Wright, Ellison, Baldwin, and Jones.
Prerequisite: English 290* or consent of instructor

347*(A-E) Studies in American Literature:
Historical Periods
347A Contemporary American Literature
A study of American literature from World War 2 to the present.
Prerequisite: English 290* or consent of instructor

350 Seventeenth Century Non-Dramatic Literature
Of the non-dramatic literature of the late Renaissance in English 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 nearly all of Milton's English poetry and a selection of his prose works.

355* Forms of Classical and Neo-Classical Satire
A study (in translation) of such classical forms of satire as formal verse satire and Menippean satire and their influence on English writers of the Renaissance and Augustan periods. Writers studied will include Horace, Juvenal, Donne, Marston, Pope, Petronius, Lucian, More and Swift. This course is offered for credit in either the Classics and Romance Languages Department or the English Department and will be taught jointly by instructors from the respective departments. (Same as Classical Civilization 321*)
(not offered in 1975-76)
356* Pastoral and Mythological Aspects of Classical and Neo-Classical Poetry
A study (in translation) of pastoral and mythological aspects in both Classical and English writers of the Renaissance and Augustan periods. Writers such as Ovid, Shakespeare, Theocritus, Vergil, Spenser, Milton and Pope will be studied. This course is offered for credit in either the Classics and Romance Languages Department or the English Department and will be taught jointly by instructors from the respective departments. (Same as Classical Civilization 322*)

362* Shakespeare 1
A study of those plays of Shakespeare written up to 1600, including the early comedies, the histories, *Romeo and Juliet* and *Julius Caesar*.

363* Shakespeare 2
A study of those plays of Shakespeare written after 1600, including the late comedies and the major tragedies.

365*-66* 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.

*Prerequisite: consent of instructor*

373 An Introduction to the History of English
The processes of linguistic change as exemplified in the development of the English language from its origins in Indo-European and Germanic through modern Canadian dialects and other forms of English in the 20th century. Traditional, structural and generative approaches to historical linguistics will be employed in this survey.

375 Linguistics and English Grammar
An interpretation of linguistics and its application in the English classroom to the study of grammar and language. The course will provide an introduction to descriptive and historical linguistics and the principles of linguistic analysis. It will include an evaluation of English grammars ranging from the traditional to the structural and transformational-generative.

376R* Our Changing Language: Syntax and Semantics 1
An evaluation of modern systems of syntax from the learned European tradition to the computer grammar of today. The course will provide a thorough and practical grounding in the structure of language and will stress the growing need for semantic interpretation. (An extensive knowledge of syntax is not assumed.)

*Prerequisites: English 141R* and 245R*

377R* Our Changing Language: Syntax and Semantics 2
The failure of descriptive dogma and its replacement by the new semantic approach which explains language as the outcome of unconscious mental processes which formulate the rules. Meaning conditions syntactic form. An assessment of its practical significance in language teaching. Of interest to the modern language student and intending teachers of English as the native or as a second language.

*Prerequisite: English 376R*

385R Twentieth Century Literature
A survey of writing in the age of anxiety from the psychoanalytic novel to the theatre of the absurd. The concept of the anti-hero in the various approaches. Satirical, emotional and intellectual writing as studied in novels and plays by Graham Green, Aldous Huxley, D.H. Lawrence, Evelyn Waugh and Harold Pinter.

*Note
R courses are administered by Renison College.*

400 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. Each student will write research essays in areas he has not already studied, choosing individual topics in consultation with his instructor and reporting to him regularly.

*Three hours a week: two hours of lectures and one of consultation on research essays.*

410 The Augustan Age (formerly English 370)
A study of English literature from 1660 to 1798, featuring the witty, bawdy comedy of the Restoration; the sophisticated satire of Dryden, Swift, and Pope; the probing of mores and manners by Pope and Johnson; the emergence and flowering of the novel with Richardson, Fielding, and Sterne; and the gradual transformation from classicism to romanticism.
415* Major Canadian Writers
An intensive study of the work of two or three major Canadian authors. The choice of authors will vary from year to year. Writers who may be studied include Morley Callaghan, F.P. Grove, Robertson Davies, A.M. Klein, Thomas Halihurst, Irving Layton, Margaret Atwood, and Margaret Laurence. Prerequisite: Consent of instructor

430 The Romantic Movement (formerly English 380)
An historical and critical study of the principles and practice of the English Romantic authors from Blake to Keats, with primary emphasis on poetry.

451 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.

460 British Literature from Shaw to Eliot
A study of the major writers in British Literature from 1890 to World War 2, with special emphasis on such writers as Shaw, Yeats, Eliot, Conrad, Joyce, and Lawrence.

Note
The following course is administered by St. Jerome's College

480J Senior Seminar
This course provides a study of the major works in those periods of English literature in which fourth-year honours students have not taken courses. It also provides a study in depth of selected authors and topics. Individual syllabi are prescribed for each student, and the course is conducted on a seminar basis.

495 Supervision of Senior Honours Essay
Environmental Studies

There are a number of courses offered in the Faculty of Environmental Studies of an integrative nature which extend across the academic interests of the four units, School of Architecture, Department of Geography, Department of Man-Environment Studies, and School of Urban and Regional Planning. The courses are of general interest and are open to all students in the University. There is no Department of Environmental Studies.

The following persons have wide ranging interests and hence have been appointed to the Faculty of Environmental Studies rather than to a specific Department and/or School:

Professor

Visiting Professor
P. Dansereau, B.A.(Montreal), B.Sc.Agr.(Montreal), D.Sc.(Geneva)

Adjunct Professor
D.B. Greenspan, B.A.(Toronto), LL.B.(Osgoode Hall)
D. Estrin, B.A., LL.B.( Alberta)

Assistant Professor
T.McL. Semple, B.A.(Western), M.A., Ph.D. (Waterloo)

Lecturer, Cartographer
A.E. Hildebrand, B.A.(Toronto)

Special Lecturer
D.G.E. Wicken, Diploma A.A.

Faculty members cross appointments as shown
1 Architecture, Geography, Man-Environment Studies and Planning
2 Man-Environment Studies and Environmental Studies
3 Geography and Environmental Studies

195* Introduction to Environmental Problems
A discussion of some major environmental problems and issues such as the population explosion, the impact of urbanization on man's environment, environmental pollution, resource management, conservation, and environmental planning.
Not available to Man-Environment Students
3 hours, Fall and Winter terms

Note
Students in the Faculty of Environmental Studies may take this course in their first or second year only.

200* Field Ecology
To introduce the main concepts and principles of ecology as a basis for understanding cycling of elements, energetics and structural organization of major ecological systems; population dynamics; impact of natural resource management practices and urban and industrial development on the environment; incorporating environmental quality considerations into development activities; "designing with nature".
Prerequisite 2nd, 3rd and 4th year students only
2 hours lecture, 2 hours lab, Fall and Winter terms

252* Media Tools for Environmental Studies
An introduction to particular media and formats appropriate to the presentation of themes and issues of concern to environmentalists. Class activities will focus on the use of audio-slide, film and television presentations. Students will be expected to commit some of their own time to the use of equipment and the preparation of presentation formats. Students may be required to purchase certain materials.
Prerequisite: E.S. students only or consent of Instructor/Coordinators
3 hours, Fall and Winter terms

253* Media Tools for Environmental Studies - Advanced Level
A more in-depth approach to the use of the media and formats used in ES 252. There will be more emphasis on a participatory approach in the utilization of equipment and the preparation of software. Students will be expected to commit some of their own time to the use of equipment and preparation of presentation formats. Students may be required to purchase certain materials.
Prerequisite: ES 252 or consent of instructor
3 hours, Winter term
358* Environmental Pollution and its Control
Guest and University of Waterloo lecturers, expert in their respective fields, discuss specific problem areas related to the environment. Representative topics include impact on groundwater of waste disposal, effect of air pollution on plant life, population problems, viruses in surface water, reutilization of waste materials. 
No prerequisite
3 hours, Fall and Winter terms

380*/381* Environmental Studies Workshop
An interdisciplinary workshop focusing upon environmental issues in a project or research format. 
Prerequisite: 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.

400 Environmental Law
Conflict as the core of all aspects of environmental relationships. A review of several current conflicts in; community planning law; ecological law; and natural resource law. We will isolate and define the legal tools available to the interests involved in such conflicts, and seek to understand both the effect and the limits of these tools under current legislation and practice. 
Prerequisite: 3rd and 4th year students
3 hours, evening, Year
Fine Arts

Professor, Chairman
V. Burnett, B.S.(Columbia), M.A.(California)

Professor
A.M. Urquhart, B.F.A.(Buffalo)

Associate Professor
N.L. Patterson, B.A.(Washington)

Assistant Professors
H. Martens, B.A., M.A.(Minnesota), Ph.D.(Columbia)
D.I. Mackay, B.F.A.(Mt. Allison), M.F.A.(Cornell)

Lecturers
C. Crockford, B.Ed.(Alberta), M.A.(British Columbia)
B. Irland, B.F.A.(Illinois), M.F.A.(Massachusetts)
W. Janzen Jr., B.Mus.(Manitoba), M.M.(Wisconsin),
A.M.M., G
H. Mackenzie, ARCA, B.F.A.(Mt. Allison)
(part time)
E. Kliman, M.A.(Toronto)
A. Roberts
V. Tahorsky, Dipl. (Prague, Czechoslovakia)
J. Uhde, M.A.(Purkyne's University, Brno
Czechoslovakia), Ph.D.(Waterloo)

Requirements for Fine Arts
General B.A. in Art

To fulfill the requirements for a general degree in
Fine Arts students must take 12 half courses in Fine
Arts, including 110*, 111*, 120*, 121*. Of the eight
remaining half courses at least four must be on the
third year level. Courses in music will be considered
as electives and not as part of the regular Art pro-
gramme in Fine Arts.

Students from any faculty may take courses in
Fine Arts on an elective basis with the consent of
their departments, or as part of their regular pro-
gramme where their departments so direct.

Undergraduate Course Descriptions—
Fine Arts

110* Introduction to World Art
A comparative survey of Western art, from pre-
historic times to the Renaissance, emphasizing visual
form as an expression of its historical and cultural
context.
No prerequisite, Fall term

111* Introduction to World Art 2
A comparative study of non-Western art, including
the Orient, and the development of modern art from
the Baroque to the Twentieth Century, emphasizing
visual form as an expression of its historical and
cultural context.
Prerequisite: Fine Arts 110*, Winter term

120* Fundamentals of Visual Art 1
An introduction to the fundamental principles and
concepts of visual art, through a series of experi-
mental studio problems in two and three dimensional
materials and media.
Lab fee, Fall, Winter term

210* Modern Art 1
A survey of the history of modern art, examining its
origins in the eighteenth century and the romantic
and realistic art of the nineteenth century, showing
how the late nineteenth century developed the basic
characteristics of the twentieth century art.
Prerequisite: Fine Arts 110*, 111* or consent of
instructor

211* Modern Art 2
A survey of modern art examining the development
of 20th century art from the Post-Impressionists
through the multiple trends of the present decade.
Both movements and individual artists will be
studied.
Prerequisite: Fine Arts 210* or consent of instructor
212* 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.
Prerequisite: Fine Arts 110*/111*, or consent of instructor

213* Italian Renaissance Art 2
A continuation of Fine Art 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.
Prerequisite: Fine Arts 212* or consent of instructor

220* Fundamentals of Painting 1
Exploration of painting problems in various media as vehicles for serious creative expression: the fundamentals of composition and painting techniques (paint, materials, and preparation of painting surfaces) will be presented through studio projects.
Lab. fee.
Prerequisite: Fine Arts 120*

221* Fundamentals of Painting 2
The creation of both non-objective and representational forms on a two-dimensional surface using oil as a painting medium.
Lab fee
Prerequisite: Consent of instructor
Winter term

222* Fundamentals of Sculpture 1
Exploration of sculpture problems in various media as vehicles for serious creative expression: emphasis will be given to developing understanding and mastery of three dimensional forms and the preparation and handling of sculptural materials and tools.
Lab fee
Prerequisite: Fine Arts 120*

223* Fundamentals of Sculpture 2
A continuation of Fine Arts 222* with an emphasis on independent problems. Lab fee.
Prerequisite: Fine Arts 222*
Winter term

224* Introductory Graphics 1 (General Drawing)
Students will make analytical and expressive drawings in a variety of media, in order to develop accurate observation and understanding of form. Lab fee.
Prerequisite: Fine Arts 120*

225* Introductory Graphics
A continuation of Fine Arts 224*
Prerequisite 224*
Winter term

226* Introductory Graphics 2 (General Printmaking)
Introductory course in materials and methods of printmaking.
Prerequisite: Fine Arts 120* or consent of instructor

226A* Introductory etching with emphasis on Intaglio printing.
Fall term

226B* Introductory woodcut and wood engraving.
Not offered 1975-76

226C* Introductory silkscreen.
Winter term

227* Scientific Drawing
Through studio experiences, students will learn techniques for making accurate scale drawings of biological subjects in line and value, using various media. Methods of preparing drawings for reproduction will be included.
No prerequisite
Fall term

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.

228A* Expressive Textile Forms
The history of textile arts and the 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.

228B* The Visual Arts and the Theatre
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.

No prerequisite for Fine Arts majors; otherwise, consent of instructor
Fall term
234* Introduction to Film Making 1
Basic introduction to the field of audio visual media: principle techniques and methods; scripting, production and directing; camera, sound and editing techniques; film forms.
Photo supplies, film stock and processing at student expense. (Super 8mm).
Lab Fee
Prerequisite: Fine Arts 120* or consent of instructor
Fall term

235* Introduction to Film Making 2
Practical introduction to film techniques. Theory, experiments and assignments in script writing, production planning, directing, editing and camera work. Further differentiation in film forms. Lab fees.
Prerequisite: Fine Arts 234*
Winter term

244* History of Film 1
General history of world cinema in its silent era (1895-1928), covering the work of outstanding directors and important movements and their contribution to the film medium as an independent art form. (Regular screening of a variety of films.)
Film fee
Fall term

245* History of Film 2 Sound Film
A continuation of Fine Art 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
Winter term

246* Religion and Film 1 (Religious Studies 266R*)
A theological approach to the study of film as a world-transforming phenomenon for man. An assessment of film's special characteristics as an art form capable of addressing man's quest for a significant existence. Consideration of a wide range of films and directors, with particular emphasis on Ingmar Bergman.
Film fee $5.00

247* Religion in Film 2 (Religious Studies 267R*)
An exploration of selected themes – death, evil, guilt, fate, alienation, love, redemption – in the films of several of today's leading directors: Bunuel, Pasolini, Kurosawa, Fellini, Antonioni, Polanski.
Film fee $5.00

310* (C. Civ. 351*) Greek Art and Architecture
A survey of the art and architecture of the ancient Greek world from the Minoan to the Hellenistic periods.
3 lectures, Consult Classics listing

311* (C. Civ. 352*) Roman Art and Architecture
A survey of the art and architecture of the Roman world from Etruscan to Imperial times.
3 lectures, Consult Classics listing

314* Medieval Art 1
A survey of painting, sculpture, architecture, and related arts from the time of early Christian art to the emergence of the Romanesque style, and including the Byzantine art of this period.
Prerequisite: Fine Arts 110* or consent of instructor

315* Medieval Art 2
A survey of painting, sculpture, architecture, and related arts commencing with the Romanesque period, continuing through to the beginning of the late Gothic period, and including Byzantine art to the capture of Constantinople.
Prerequisite: Fine Arts 314* or consent of instructor

316* Canadian Native Art
The arts and crafts of Canadian Indian and Inuit (Eskimo) peoples are examined with slide lectures, films, and student presentations.
No prerequisites.

317* Canadian Art 2
A continuation of Fine Arts 316*.
Prerequisite: Fine Arts 316*

319* Contemporary Art
A seminar exploring contemporary artistic concepts through critical analysis, historical correlations, discussions with artists and visits to studios and galleries.
Prerequisite: consent of instructor
Winter term

320* Advanced Painting 1
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.
Prerequisite: Fine Arts 220* or consent of instructor
Winter term

321* Advanced Painting 2
A continuation of Fine Arts 220* with emphasis on independent problems. Lab fee.
Prerequisite: Fine Arts 220*

322* Advanced Sculpture 1
Exploration of sculpture problems, specifically the organization and integration of three dimensional objects in a real environment. Lab fee.
Prerequisite: Fine Arts 222*
323* Advanced Sculpture 2
A continuation of Fine 322* with emphasis on independent problems. Lab fee.
Prerequisite: Fine Arts 222*

323A* Assemblage
A two and three dimensional study of the various aspects of assemblage, including visual poetry, processes, events, conceptualization, structuralism.
Fall term

324* Advanced Drawing
A course in which drawing is investigated as a means of expression and communication. An understanding of the human figure – its structure, its movement, and its connotation – will be a central goal of the work. Objects and the landscape will also be studied as sources of artistic possibility. The student will be encouraged to experiment with imagery, to develop personal vision, and to devise individual formal modes of expression. Lab fee.
Prerequisite: Fine Arts 224 and consent of instructor

325* Advanced Drawing 2
A continuation of Fine Arts 324*.

326* Advanced Printmaking 1
The practice and study of various graphic techniques with emphasis on coloured intaglio, silk screen, and photographic processes. Lab fee. 
Prerequisite: Fine Arts 226*

327* Advanced Printmaking 2
A continuation of Fine Arts 326* with emphasis on independent problems. Lab fee.
Prerequisite: Fine Arts 326*

328* 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 Contemporary free scripts. Lab fee.
No prerequisites

329* Illustration
Studio work in techniques and theory of book illustration, together with slide lectures on the history of printed forms.
Prerequisite: consent of instructor
Winter term

334* Advanced Film Making 1
Further exploration in documentary film. Visual significance, motivation and other aspects of script writing. Film Stock and processing paid by students.
Prerequisite: Fine Arts 234* and 235*. Fall term

335* Advanced Film Making 2
Examination of production methods in film and TV industry. Production of films. Lab fee.
Prerequisite: Fine Arts 334*

346R*/347R* Special Topics in Film
Special topics will be announced from year to year.

370* Film Theory 1 (Anatomy of Film)
Discussion of the aesthetic aspects of cinematographic work (principles known as "film language").
Prerequisite: consent of instructor

371* Film Theory 2 (Film Aesthetics and Criticism)
An extension of Fine Arts 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.
Prerequisite: Fine Arts 370*. Winter term

390* Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.
Fall term

391* Selected Subjects in Fine Arts
Research and reading courses under the direction of individual instructors.
Admission by consent of instructor.
Winter term

392* Selected Subjects in Fine Arts
Studio and practice courses under the direction of individual instructors.
Admission by consent of the Instructor.
Fall term

420* Senior Seminar in Graphics Techniques 1
Admission by consent of instructor
Fall term

421* Senior Seminar in Graphics Techniques 2
Admission by consent of instructor
Winter term

434* Senior Seminar in Film Techniques 1
Extended study and practice of film forms and techniques. Production of films with pedagogic value. Film stock and processing paid by the students.
Prerequisites: Fine Arts 334 and 335
Fall term
Course Descriptions
Fine Arts

435* Senior Seminar in Film Techniques 2
Continuation of 434. Production of films based on fiction. Film stock and processing paid by students.
Prerequisite: Fine Arts 434
Winter term

470* Senior Seminar in Film Concepts 1
Admission by consent of instructor

471* Senior Seminar in Film Concepts 2
Admission by consent of instructor

472* Senior Seminar in Graphics Concepts 1
Admission by consent of instructor

473* Senior Seminar in Graphics Concepts 2
Admission by consent of instructor

490* 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

491* Senior Honours Presentation 2
A continuation of Fine Arts 490*
Admission by permission only

Requirements for Fine Arts General B.A.
Degree in Music:

To fulfill the requirements for a general degree in Fine Arts in Music, students must take the equivalent of 14 half course in Music including 150G*/151G*, 254G/255G*, 351G*/352G* and 2 half courses in Materials of Music available by cross-registration at Wilfrid Laurier University. Besides, students must demonstrate competence on one instrument (including voice) equal to Grade 10 standing at the Toronto conservatory of Music. The remaining courses must be selected in consultation with the Music Faculty.

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

Undergraduate Course Descriptions—Music

150G* Introduction Music 1
Examination by means of listening and analysis, of styles of music ranging from early Christian Chant to electronic and computer music. Composition to be studied include major forms such as sonata, symphony, opera, mass, etc., as well as smaller forms.
3 lectures. Fall term

151G* Introduction to Music 2
Continuation of 150G*.
Prerequisite: 150G* or consent of instructor
3 lectures. Winter term

160G* Choral Literature 1
Choral literature from the Renaissance period to the present will be introduced through singing reading sessions, discussion and performance. Repertoire will vary from year to year and will be suited to the existing choral ensemble.
Prerequisite: Permission of the instructor
3 hours minimum. Fall term

161G* Choral Literature 1
Continuation of 160G*
Prerequisite: 160G* or consent of instructor
3 hours minimum. Winter term

166G* Music Studio
Practical performance study with approved instructor and examination administered by Music Faculty. A half-course credit normally requires two terms of private study, but may be achieved in one term if supplemented with approved related studies in music literature.
Prerequisite: Consent of Music Faculty
3 lectures. Fall term

254G* Bach to Beethoven
Music from around 1700 to 1827, the Baroque and Classical Periods of music. Major composers studied are Bach, Haydn, Mozart, and Beethoven. Listening to music is an integral part of the course.
Prerequisite: 150G*/151G*
3 lectures, Fall term

255G* Music of the Romantic Period (19th century)
Included among the many musical compositions studied are operas of Wagner, Verdi and Mussorgsky, the lieder of Schubert, Schumann and Wolf, symphonic of Brahms, Mendelssohn, Tschaikowsky, and piano music by Chopin.
Prerequisite: 150G*/151G*
3 lectures. Winter term
260G* Choral Literature 2
Choral Literature from the Renaissance period to the present will be introduced through singing reading sessions, discussion and performance. Repertoire will vary from year to year and will be suited to the existing choral ensemble.
Prerequisite: 160G* or consent of instructor
3 hours minimum. Fall term

261G* Choral Literature 2
Continuation of 260G*.
Prerequisite: 260G* or consent of instructor
3 hours minimum. Winter term

262G* Instrumental Literature
The study of the music written from the seventeenth century to the present for a variety of instrumental groups, such as chamber music, symphony, concertos.
Prerequisite: 150G* or consent of instructor
3 lectures. Fall term

263G* Instrumental Literature
Continuation of 262G*.
Prerequisite: 262G*
3 lectures. Winter term

266G* Music Studio
See 166G* for course description.
Prerequisite: 166G* and consent of Music Faculty

273G* Traditional Folk Music
Countries to be discussed: Great Britain, Canada, the United States and the Antipodes. A series of lectures and discussions supplemented by records, tapes, and field recordings. Delineation of characteristic motifs in folk music. Various folk instruments will be used by the lecturer throughout the course: guitar, auto harp, hammer dulcimer, appalachian dulcimer, and five string banjo.
3 lectures. Winter term

300G* Stratford Festival Seminar
An interdisciplinary course intended for students interested in English, Music, Drama, and Speech. The focus of the seminar is centred in the dramatic and musical productions at Stratford Festival theatres plus performances at the Shaw Festival at Niagara-on-the-Lake and selected productions at Toronto and London, Ontario.
Not offered 1975-76
Prerequisite: An introductory course in Music, Drama, or Speech, or consent of instructor.

301G* Stratford Festival Seminar
Continuation of Fine Arts 300G*.
Not offered 1975-76

351G* Ancient, Medieval and Renaissance Music
The study of music from pre-Christian times to approximately 1600.
Prerequisite: 150G* or 151G*
3 lectures. Fall term

352G* Music of the Twentieth Century
A study of representative musical compositions of the twentieth century and their relationship to social, literary and political movements.
Prerequisite: 150G* or 151G* or consent of instructor
3 lectures. Winter term

355G*/356G* Music of the Classical Period (ca. 1750-1820)
A summer seminar to be taught in Salzburg, Vienna, and environs. The course will comprise daily lectures and attendance of musical performances such as concerts, operas, masses, oratorios, recitals, etc., of the music of Haydn, Mozart, Beethoven and Schubert, as well as tours of places relating to the music of Vienna masters.
Prerequisite: 150G* or 151G* or consent of instructor
Not offered 1975-76

360G* Music of the Church
A study of the music, and the philosophies of music of the Christian church from the beginning to the present. Singing and/or listening to the music will be an integral part of the course.
Prerequisite: 150G* or 151G* or consent of instructor
3 hours minimum. Fall term

361G Music of the Church
Continuation of 360G*
Prerequisite: 360G* or consent of instructor
3 hours minimum. Winter term

366G* Music Studio
See 166G* for course description.
Prerequisite: 166G* and consent of Music Faculty

380G*/381G* Directed Study in Music
Prerequisite: Advanced standing in music and consent of the instructor

466G* Music Studio
See 166G* for course description.
Prerequisite: 166G* and consent of Music Faculty
General Engineering

Undergraduate Course Descriptions

000 Tutorial
Students will meet with a faculty member designated as their class professor. Performance in problem assignments and conceptual difficulties with other courses will be discussed, along with interrelation of present coursework, later work and engineering practice.
1 hour per week, both terms. (Consultation periods with teaching assistants regarding specific course problems if required at the initiative of the students or the class professor, will be available.)

010 Orientation
Given by the Department of Co-ordination in Fall and Winter terms for students in first year Engineering. Its purpose is to introduce the students to the various features of the Co-operative Programme. Discussion concentrates on such aspects as the role of the Department of Co-ordination, preparation for and participation in the employer interviews, work reports, and the expectations of the work term.

061 History and Philosophy of Science
The major conceptual transformations in the evolution of science and technology.
The nature of science: science and technology in Egypt and Babylon. The development of science in Greece. The Alexandrian school and the separation of science and philosophy. The medieval attitude toward science. The Renaissance. Copernicus and Galileo. Sir Isaac Newton. Developments during the 18th and 19th centuries. The 20th century revolution in pure science and technology; scientific technology as a determining characteristic of global civilization and some critical questions it poses.
3 hours per week

062 Introduction to Human Communication Systems
Broadly, 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. Necessary fundamental concepts from these disciplines. Applications of the theories in fields relevant to the student.
3 hours per week, lectures and seminars

101 Topics from Scientific Thought
A variety of topics selected from modern science are treated in the lectures at a conceptual level and then used as a base for discussion. Certain aspects of historical, philosophical and particularly social significance are included according to the inclinations of the students and discussion leaders.
3 hours per week. Not offered in 1975-76

102 Introduction to the Sciences of Man
The course is intended to introduce engineering, mathematics and science undergraduates to some of the sciences of man (anthropology, sociology and psychology). The course will be conducted on the basis for both lecture and tutorial hours. Lectures will be under the supervision of a single person responsible for the conduct of the course. He may invite participation from the interested disciplines as required.
3 hours per week

103 Topics from the Arts and Humanities
The course will explore some of the major movements of thought which are still shaping modern affairs and modern consciousness. The topics may vary from term to term but examples would be Marxism, Racism, Freudianism, Existentialism, the meaning of civilization, artistic expression and Christianity. Lectures, readings and Seminars together should offer a stimulating, if glancing, acquaintance with a few of the major strands of the present intellectual environment.
3 hours per week

111 Graphics (A Term)
A course in the fundamentals of graphical projections of all types - orthographic, isometric, oblique and true perspective. Introduction to spatial co-ordinate plotting. Fundamentals of freehand sketching for communication of concept.
3 hours per week

111 Graphics (B Term)
The application of graphics to the solution of vector problems, both coplanar and non-coplanar. Graphic calculus, both integration and differentiation, design of all types of nomographs: design of special slide rules: continuation of free hand sketching.
3 hours per week
113 Engineering Measurement
3 hours lecture, term project
Fall term only

120 Engineering Synthesis
Principles of problem statement, analysis, and concept creation in the design process. Discussion of planning, the flow of information, physical, economic and financial feasibility, and concept selection as related to project design. Discussion of social and economic conditions affecting value and utility, and their relationship with the design process in the solution of engineering problems. The application of simulation, modelling and optimization to the above; three term projects.
2 hours lecture, 1 hour tutorial
Winter and Spring terms

121 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.
2 hour lecture, 2 hour tutorial, one term
Winter and Spring terms

122 Electricity and Magnetism
Introduction to fundamentals of electromagnetics, circuits, wave motion and propagation. Electromagnetics: Coulomb’s Law, electric field and potential, capacitor; resistivity and Ohm’s Law; Ampere’s Law, magnetic fields and forces, inductor. Circuits: series and parallel circuits. Kirckhoff’s laws; ohmic dissipation of energy, stored energies in capacitors and inductors. Wave motion: graphical representation, rotating vectors, superposition. Wave propagation: i) sound: velocity, wavelength, energy, frequency and resonance, ii) optics: plane, concave and convex mirrors and lens; reflection and refraction; interference and diffraction, polarization; electricity and light.
3 hours lectures, 2 hours lab, 1 hour tutorial
Winter and Spring terms

250 Basic Concepts of Engineering and Applied Science
Some of the basic analytical tools common to engineering and applied science will be developed and used to clarify the roles of the different groupings within science and technology. Topics covered will include quantification, probability, precision, methods of representation, graphs, the design process, testing, modelling, historical basis and some future considerations. 
3 hours per week. No prerequisites. Fall term. Non-engineering students only.
Department of Geography

Associate Professor, Chairperson of the Department
G.R. McBoyle, B.Sc., Ph.D. (Aberdeen)

Professor, President of the University
B.C. Matthews, B.S.A. (Toronto), A.M. (Missouri), Ph.D. (Cornell)

Associate Professor, Associate Chairperson
L.H. Russwurm, B.A., M.A. (Western), Ph.D. (Illinois)

Associate Professor, Associate Dean

Associate Professor, Graduate Officer
W.B. Mitchell, B.A., M.A. (U.B.C.), Ph.D. (Liverpool)

Assistant Professor, Undergraduate Officer
T.E. Bunting, B.A. (York), M.A. (Western)

Professors
A. Diem, B.A. (Wayne State), M.A. (Clark), Ph.D. (Michigan), (on Sabbatical Leave 1975-76)
D.K. Erb, B.Sc. (Western), M.A. (Toronto), Ph.D. (McGill)
R.M. Irving, B.A., M.A. (Toronto), Ph.D. (Minnesota)
R.R. Krueger, B.A., M.A. (Western), Ph.D. (Indiana), (on Sabbatical Leave 1975-76)
R.E. Preston, B.A., M.A. (Washington), Ph.D. (Clark)
H.D. Steiner, M.Sc., Ph.D. (Zurich)

Associate Professors
R.A. Bullock, B.A., M.A. (Belfast), Ph.D. (London), (on Sabbatical Leave 1975-76)
J.S. Gardner, B.Sc. (Alberta), M.Sc., Ph.D. (McGill)
A.B. Kesik, M.A., Ph.D. (UMCS - Lublin, Poland)
C.G. Mulamoottil, B.Sc. (Mysore), M.Sc. (Bombay), Ph.D. (Delhi), (on Sabbatical Leave 1975-76)
G.B. Priddle, B.A. (Western), M.A., Ph.D. (Clark)
D.F. Walker, B.Sc. (London), M.A., Ph.D. (Toronto)

Assistant Professors
C.R. Bryant, B.A., Ph.D. (London School of Economics)
B. Hyma, B.S., M.S. (Madras), M.S. (Sheffield), Ph.D. (Pittsburgh), (on Sabbatical Leave Winter term 1976)
R. Johnson, B.A., M.A. (Windsor), Ph.D. (Minnesota)
E.R. Officer, B.A. (U.B.C.), M.A. (Wisconsin)
G. Wall, B.A. (Leeds), M.A. (Toronto), Ph.D. (Hull)

Lecturer and Cartographer
A.E. Hildebrand, B.A. (Toronto)

Faculty members holding cross and/or joint appointments as shown
1 Planning, Geography and Biology
2 Geography, Planning
3 Architecture, Geography, Man-Environment Studies and Planning
4 Renison College and Geography
5 Recreation and Geography

The following represents a grouping of the course offerings of the Department of Geography according to subject matter. This should act as an additional guide in selecting courses. The course descriptions themselves are found after this and are in numerical order.

Human Geography

General/Introductory
101* Introduction to Human Geography
195* Introduction to Environmental Problems
202* Some Basic Topics of Economic and Urban Geography
203* Some Basic Topics of Cultural and Regional Geography

Cultural, Historical, Political
232* Geography of Population
330* Cultural Geography
331* Special Topics in Cultural Geography
332* Special Topic in the Geography of Population
341* Historical Geography of Canada 1
342* Historical Geography of Canada 2
345* Political Geography
445* Advanced Political Geography
## Regional
- 125R* Introduction to the Developing World
- 126R* The Emerging “Third” World
- 225R* Urbanization in Newly Developing Countries
- 226R* Population Growth and Resource Development in “Third World” Countries

## World Regional Geography
- 320 World Regional Geography
- 426-432 Different World Regions

## Regional Problems of Europe
- 421 Europe and the Mediterranean
- 423 Central and Eastern Europe

## Geographic Perspectives on Contemporary Problems of the American Society
- 321* Geographic Perspectives on Contemporary Problems of the American Society

## Geographical Study of Canada
- 322* Geographical Study of Canada

## Geographical Study of a Selected Region
- 323* Geographical Study of a Selected Region

## Soviet Geography
- 324* Soviet Geography
- 325* Africa

## Africa
- 425* Africa

## Resource Management
- 356* Resources Management
- 357* Conservation and Resource Management
- 410* Recreation Geography
- 411* Resource Studies
- 413* Behavioural Studies
- 358* Environmental Pollution and its Control
- 380*/381* Environmental Studies Workshop
- 400* Environmental Law
- 414* Resources Management Workshop

## Advanced Economic Geography 1 Manufacturing and Transportation
- 311* Advanced Economic Geography 1 Manufacturing and Transportation

## Industrial Cartography
- 260* Introduction to Cartography and Map Analysis
- 360* Preparation of Maps and Illustrations

## Agricultural Geography
- 315* Agricultural Geography
- 452* Problems of Rural Land use

## Urban Areas in North America
- 251* Urban Areas in North America
- 330* Regional Urban Systems 1
- 450* Regional Urban Systems 2

## The City as a System 1
- 349* The City as a System 1

## The City as a System 2
- 449* The City as a System 2

## Miscellaneous
- 475* Special Readings and Seminar on Selected Topics
- 476 Special Readings and Seminar on Selected Topics

## Physical Geography

### General/Introductory
- 102* Introduction to Physical Geography
- 200* Field Ecology
- 201* Some Basic Topics of Physical Geography

### Ecology
- 451* Soils Geography
- 460* Land Dereliction and Rehabilitation

### Climatology
- 301* Climatology
- 408* Special Topics in Climatology and Natural Hazards

### Geomorphology
- 300* Geomorphology and the Southern Ontario Environment
- 302* Geomorphological Processes
- 303* Physical Basis and Geography of Water
- 400* Climatic and Periglacial Morphology
- 401* Glacial Geomorphology and Some Contemporary Applications
- 402* Physical and Chemical Processes in Geomorphology
- 406* Tropical Geomorphology
- 407* Field and Lab Techniques in Geomorphology

### Techniques and Methodology

#### General
- 270* Introduction to Cartography and Air Photo Interpretation
- 252* Media Tools for Environmental Studies
- 253* Media Tools for Environmental Studies – Advanced Level

#### Cartography
- 260* Introduction to Cartography and Map Analysis
- 360* Preparation of Maps and Illustrations
- 403* Advanced Cartography 1
- 404* Advanced Cartography 2

#### Remote Sensing
- 275* Introductory Air Photo Analysis and Remote Sensing
- 375* Air Photo Interpretation and Remote Sensing 1
- 470* Air Photo Interpretation and Remote Sensing 2
- 471* Air Photo Interpretation and Remote Sensing 3
Course Descriptions

Geography

Quantitative Analysis
271* Introduction to Quantitative Research Methods
272* Computer Programming in Environmental Studies
307* Social Survey Techniques
316* Multivariate Statistics
317* Nonparametric Statistics
318* Spatial Analysis
319* Regional Planning Techniques

Independent Research Oriented
110* Tutorial in Geography
391* Field Research
430 Field Research in Regional Geography
490 Senior Honours Research Essay

Nature and Philosophy of Geography
381* The Nature of Geography
480* Development of Geographic Thought
481* Frontiers in Geography
482* Geography and Education

Undergraduate Course Descriptions

101* Introduction to Human Geography
An introduction to human geography through a survey of some of the concepts, methods, techniques and applications of geographic analysis of man's cultural environment. The man-land theme, and the location analysis theme are emphasized throughout.
No prerequisite
2 hours lectures, 2 hours lab, Fall and Winter terms

102* Introduction to Physical Geography
An ecosystem approach to physical geography which emphasizes that man's natural environment is an integrated system of which man is a part. Selected aspects of weather and climate, soils, biogeography, and landforms are studied and the flows of energy, water and matter and the resultant effects on the subsystems of the natural environment are emphasized.
No prerequisite
2 hours lectures, 2 hours lab, Fall and Winter terms

110* Tutorial in Geography
A tutorial for first year geography majors designed to promote close contact with a faculty member. Students will follow a personalized programme within the realm of geography. Times and meetings will be arranged individually.
No prerequisite
Fall and Winter terms

125R* Introduction to the Developing World
An introduction to problems of population growth, resource development, cultural diversity, and of industrial and urban growth in developing areas of the world. Contemporary problems of economic, cultural and demographic differences will be examined in selected regions of Asia and Africa.
No prerequisite
3 hours, Fall term

126R* The Emerging “Third World”
The emergence of the “Third World” in international relationships. Background factors: the impact of occidental culture in colonial and post-colonial times; changes in technology, economic organization, rapid population growth, resource development problems, political unrest. The challenge to the wealthy, industrialized countries posed by the needs of the populations of Africa and Asia.
No prerequisite
3 hours, Winter term

127* 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.
One two hour seminar, Winter term

195* Introduction to Environmental Problems
See Environmental Studies course descriptions, page 299.

200* Field Ecology
See Environmental Studies course descriptions, page 299.

201* Some Basic Topics of Physical Geography
Further study of energy and matter flows in the atmosphere and on the land. Specific topics include global radiation balances, energy flux at the land-air interface, weather modification, urban climates, climate classification systems, the physical processes in the pollution of land, air and water, the dynamics and morphology of stream systems and glacial landform systems.
Prerequisite: Geography 102
2 hours lectures, 2 hours lab, Fall term
202* Some Basic Topics of Economic and Urban Geography
An analysis of the locational structure of economic activities. Basic concepts and tools are explained; these are used to analyze the locational structure of primary, secondary, and tertiary activities. Throughout, an attempt is made to evaluate the locational models under discussion by reference to case studies. The analysis is placed in the overall context of regional development.
Prerequisite: A first-year human geography course
2 hours lectures, 2 hours lab. Fall and Winter terms

203* Some Basic Topics of Cultural and Regional Geography
The approach of the regional geography is illustrated by reference to one or more world regions. Political, social, and historical processes are studied as they affect man's perceptions of his environment and the identification of culture regions.
Prerequisite: A first-year human geography course
2 hours lectures, 2 hours lab, Winter term

225R* 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.
No prerequisite
3 hours, Fall term

226R* Population Growth and Resource Development in "Third World" Countries
Some major problems of population explosion, food supply and economic development faced by the developing countries. The course also covers technological and ecological aspects of international agricultural development. Emphasis placed on case studies of selected countries from Tropical Africa, Asia, Tropical South America, and the Caribbean region.
No prerequisite
3 hours, Winter term

232* Geography of Population
No prerequisite
2 hours lectures, 1 hour lab, Fall term

251* Urban Areas in North America
An introduction to some basic concepts in urban studies emphasizing a systematic approach to processes and problems of urban development in North America, particularly in Canada. The course is staffed by faculty members from different departments and is designed to present an interdisciplinary perspective on urban systems.
Prerequisite
3 hours lecture, Fall term

ES 252* Media Tools for Environmental Studies
See Environmental Studies course descriptions, page 299.

ES 253* Media Tools for Environmental Studies - Advanced Level
See Environmental Studies course descriptions, page 299.

260* 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.
Prerequisite: Geography 102*
2 hours lectures, 2 hours lab, Fall term

270* Introduction to Cartography and Air Photo Interpretation
Principles of the presentation of the earth's surface on maps and air photographs. Basic techniques of map compilation and reproduction. Interpretation of air photographs primarily in the field of resource inventory.
No prerequisite
Not offered 1975-76

271* 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. This course is the same as Plan 271* and M.Env. 271*. The Department of Geography strongly recommends that students who have not had Year 5 Maths., take Math 85*.
Prerequisite: only for students in General or Honours Geography, Planning, Man-Environment Studies, or Architecture
2 hours lecture, 1 hour lab, Fall and Winter terms
272* Computer Programming in Environmental Studies
The course emphasizes programming skills and applications in the context of environmental problems. Cross listed with Planning and Man-Environment Studies
Prerequisites: Geog./M.-Env./Plan 271*, or consent of instructor
3 hours, Winter term

275* 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. Prerequisite: Geography 102* and a first-year human geography course
2 hours lectures, 2 hours lab, Fall and Winter terms

300* Geomorphology and the Southern Ontario Environment
This course emphasizes field work and field trips in exploring the evolution of S. Ontario landforms. The identification of landforms, landform assemblages and their relationships. Selected techniques, e.g. surveying and levelling, particle size analysis, and till fabric analysis which help in the systematic collection and analysis of field data will be used. There will be a $15. charge per student for field trip expenses. Prerequisite: Geography 201*, or Earth Sciences 130 or consent of instructor
2 hours lecture, 4 hours field lab, Fall term

301* Climatology
Advanced study of the elements and mechanics of climate and weather. Analysis of world climatic and weather patterns. Effects of climate on man's activities and on the distribution of natural vegetation and soils. Weather forecasting. Applied climatology. Prerequisite: Geography 201*
2 hours lectures, 2 hours lab, Winter term

302* Geomorphological Processes
The impact of processes in landform development and modification will be analyzed. Techniques of measurement will be discussed particularly as they show the impact of changes over time. Special areas of concern will be mass movement, weathering and morphological changes under different climatic conditions and processes connected with glaciation and de-glaciation, and eolian, karst, coastal and fluvial landforms. Prerequisite: Geography 201* or Earth Sciences 130 or consent of instructor
2 hours lectures, 2 hours lab, Fall term

303* Physical Basis and the Geography of Water
The geography of water, including snow and ice. Specific topics include: the earth's water balance and cycle, the oceans, lakes and swamps, snow cover, ground ice, glacier ice and streams. Attention is directed to the impact of water on the earth's surface, the role of water in the earth's system, and water as a resource and hazard. Some field work. Prerequisite: Geography 201* or consent of instructor
2 hours lectures, 2 hours lab, Winter term

307* Social Survey Techniques
Social research and the planning process; interview and self administered surveys; questionnaire design; profile data; sampling; data processing; non-survey data collection techniques; practical applications. This course is the same as Plan. 307*. Prerequisite: May be taken in 2nd or 3rd year
2 hours lectures, 1 hour practical or discussion, Fall and Winter terms

311* Advanced Econ. Geog. 1 Manufacturing and Transportation
Studies in the geography of manufacturing and transportation; further development of theory and empirical studies of Canada and the United Kingdom. Prerequisite: Geography 202* or consent of instructor
3 hours, Fall term

315* Agricultural Geography
The study of agriculture as a system, and an analysis of the geographical dimensions of agricultural systems. Issues include the diffusion of innovations, regional evolution of agricultural structure and vertical integration. Structural problems in agriculture are emphasized through a comparative study of programs of government intervention in agriculture in Canada and Europe. Some field trips. Prerequisite: Geography 202* or consent of instructor
3 hours, Fall term
316* Multivariate Statistics
The theory and application of multivariate statistics, with particular emphasis upon use of the computer. Same as Plan 316*.
Prerequisite: Geography 271* or consent of instructor
3 hours seminar and/or tutorial, Fall term

317* Nonparametric Statistics
The theory and application of nonparametric statistics, with particular emphasis upon social science problems. Same as Plan. 317*.
Prerequisite: Geography 271* or consent of instructor
2 lectures, 1 hour practical or discussion, Winter term

318* Spatial Analysis
Advanced quantitative analysis applied to spatial patterns and interactions. The course will focus on a selection of techniques from gravity models, linear programming, nearest neighbour analysis, Markov chain analysis, graph theory, simulations, and trend surface analysis. This course is the same as Plan. 318*.
Prerequisite: Geography 271* or consent of instructor
3 hours, Winter term

319* Regional Planning Techniques
Discussion, appraisal and application at the regional level of selected economic techniques—specifically, cost-benefit analysis, planning-programming-budgeting systems and input-output analysis. This course is the same as Plan. 319*.
Prerequisite: Economics 101* or consent of instructor
3 hours seminar and/or tutorial, term to be arranged

320 World Regional Geography
Study in depth of selected areas of the world's climatic regions, emphasizing characteristic problems as well as their physical, cultural and economic interrelationships. Utilization of natural resources, the effects of increasing population density, the occupancy and utilization of urban and rural lands, and the effects of man's tools, techniques and institutions on the earth's surface.
No prerequisite
Not offered 1975-76

321* Geographical Perspectives on Contemporary Problems of the American Society
Focus on three critical problem areas of contemporary life in America: natural resources and environmental quality, regional economic disparities, management of large metropolitan systems. Student participation by means of collective project-seminar work. Liberal use of audio-visual materials to generate interest, to spark discussion and to serve as a substitute for the field experience.
Prerequisite: Any half course in human geography or consent of instructor
3 hours, Winter term

322* Geographical Study of Canada
Geographical basis of Canada and Canadian issues. Selected problems relating to environmental quality, urbanization, regional and resource development. This course is the same as Plan. 222*.
No prerequisite
3 hours, Fall term

323* Geographical Study of a Selected Region
A geographical analysis of a selected region and its current problems. The region chosen in any given year will depend on the specialized knowledge of faculty available and student demand.
No prerequisite
Not offered 1975-76

324* Soviet Geography
Introduction to the geography of the Soviet Union, with a focus on selected problems in urbanization, industrialization, resource use and regional economic development in a planned economy.
No prerequisite
3 hours, Fall term

325* Africa
The geography of modern Africa south of the Sahara in the context of changing attitudes to the continent on the part of the "developed" countries.
No prerequisite
Not offered 1975-76

330* Cultural Geography
Problems in the delimitation of cultural regions. A study of the diversity of man in his relations with his environment.
No prerequisite
Not offered 1975-76
331* Special Topics in Cultural Geography
A detailed investigation of selected issues in man's relations with the natural environment. Given as a seminar. Issues will be partially selected on the basis of the interests of participants.
Prerequisite: Geography 330* or consent of instructor
Not offered 1975-76

332* Special Topics in the Geography of Population
Detailed study of selected topics of population geography.
Prerequisite: Geography 330* or consent of instructor
3 hours, Winter term
Not offered 1975-76

341* Historical Geography of Canada 1
The changing geographies of settlement and resource use from the Discoveries to the early nineteenth century.
Prerequisite: Geography 203* or consent of instructor
3 hours, Fall term

342* Historical Geography of Canada 2
The changing geographies of settlement and resource use in the nineteenth and early twentieth centuries.
Prerequisite: Geography 202* or consent of instructor
3 hours, Winter term

345* Political Geography
A systematic approach embracing a general introduction to methodologies and subjects central to the field. Case studies and discussion subjects will be selected on the basis of student interests.
Prerequisite: A second year human geography course or consent of instructor
3 hours, Winter term

349* The City as a System 1
An examination of theories, models, and research procedures appropriate to the study of internal urban structure. The course focuses on the analysis of city-wide processes. Topics include urban land use, spatial economic processes, transportation and interaction, urban systems, individual spatial behaviour, decision-making (public and private), urban growth, and the processes of development and redevelopment.
Prerequisite: Geography 202* or 251* or consent of instructor
3 hours, Fall term

350* Regional Urban Systems 1
An examination of theories, models, and research procedures appropriate to the study of the external structure and function of urban centres and their role in the spatial economy. Focuses on the growth and support of urban centres and city systems, on relationships between aspects of urbanization and regional development, on the outward growth of cities, and on analytical techniques useful in studying such topics.
Prerequisite: Geography 202*, Geography 251* or consent of instructor
3 hours, Fall term

356* Resources Management
Theoretical and conceptual approaches to resources studies emphasizing behavioural and economic considerations; evaluation of management practices in fisheries, forestry, water and minerals; research techniques.
Prerequisite: Geography 202* or consent of instructor
3 hours, Fall term

357* Conservation and Resource Management
History of the conservation movement; ecological principles of conservation and resource management and the development of resources. Analysis, use and planning of recreational resources. The course is the same as Plan 357* and M. Env. 357*.
Prerequisite: ES 200* and only for 3rd and 4th year students
3 hours, Winter term

ES 358* Environmental Pollution and its Control
See Environmental Studies course descriptions, page 299.

360* 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.
Prerequisite: Geography 260* or consent of instructor
1 hour lecture, 2 hours lab, Winter term

375* Air Photo Interpretation and Remote Sensing 1
The principles of air photo interpretation via indepth analysis of elements of the air photo including rock types, landforms, drainage patterns, erosion characteristics, tonal variations, boundary characteristics, vegetation characteristics and patterns, and man-made features. Examples drawn from geology, geography and vegetation mapping. This course is a prerequisite for Geography 470*.
Prerequisite: Geography 275* and Geography 201* or Earth Sciences 130, or consent of instructor
2 hours lectures, 2 hours lab, Winter term
ES 380*/381* Environmental Studies Workshop
See Environmental Studies course descriptions, page 300.

381* The Nature of Geography
The past traditions in geography. Modern trends in geographical research and teaching.
Prerequisite: Any three full geography credits or consent of instructor
2 hours seminar, Fall and Winter terms

391* 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.
Prerequisite: Third Year Honours Geography students only or consent of instructor
2 hours seminar, Fall term
Estimated cost to student: $50.00

ES 400 Environmental Law
See Environmental Studies course descriptions, page 300.

400* Climatic and Periglacial Morphology
Characteristics of the main principles of climatic and climatogenetic geomorphology. Examination of processes and forms related to the periglacial environment.
Prerequisite: One of Geography 300*, Geography 302*, or Earth Sciences 342* or consent of instructor
Fall term

401* Glacial Geomorphology and some Contemporary Applications
Advanced study of the total effect of glaciation. Glacial and fluvioglacial deposits and depositional conditions will be analysed. Special attention on the environmental influences of glaciation and on practical applications of glacial geomorphologists' techniques and information.
Prerequisite: One of Geography 300*, Geography 302*, or Earth Sciences 342* or consent of instructor
3 hours seminar/lab, Fall term

402* Physical and Chemical Processes in Geomorphology
Applications of the principles of soil and rock mechanics, hydrology, and geochemistry in the analysis of geomorphic processes; watershed behaviour, fluvial processes, sediment transport, dynamics of shoreline behaviour, evolution of natural slopes, chemical processes in weathering and applications to various geologic conditions, hydrologic and chemical interactions in karst phenomena, role of ice in river and frozen ground systems. Cross listed as Earth Sciences 445*.
Prerequisite: One of Geography 300*, Geography 302*, or Earth Sciences 342* or consent of instructor
Not offered 1975-76

403* Advanced Cartography 1
Advanced study of numerical map analysis and computer mapping techniques.
Prerequisite: Geography 260*, or 271* or consent of instructor
2 hours seminar and/or tutorial, Fall term

404* Advanced Cartography 2
Review of conventional production and reproduction techniques for cartographic illustrations. Photography and photomechanical processes applied to cartographic operations. Analysis and application of alternate design and production solutions to cartographic problems.
Prerequisite: Geography 260* or 360* or consent of instructor
3 hours lecture/lab, Winter term

406* Tropical Geomorphology
Basic geomorphological concepts and their application in a tropical environment. Special emphasis on morphology and processes as related to the geological foundation.
Prerequisite: One of Geography 300*, Geography 302*, Earth Sciences 342* or consent of instructor
Fall term

407* Field and Lab Techniques in Geomorphology
An analysis of the range of techniques used by geomorphologists. This course will involve intensive field, surveying, mapping and laboratory work. There will be a charge of between $15. and $20. for field trip expenses.
Prerequisite: Geography 300*, Geography 302*, Earth Sciences 342* or consent of instructor
Not offered 1975-76
408* Special Topics in Climatology and Natural Hazards
Special studies in economic aspects of climate; atmospheric pollution potential; perception of urban climate and air pollution; weather modification; the atmosphere as a natural resource system. Studies of natural hazards.
_prerequisite: Geography 301* 
Not offered 1975-76

409* Recreation Geography
The environmental implications of existing and potential recreational demands. Recreational travel, site capability, economic and ecological impact models will be considered as well as the behavioural aspects of amenity resources.
_prerequisite: Geography 356* or consent of instructor
3 hours, Fall term

410* 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.
_prerequisite: Geography 356* or Geography 410*
3 hours, Winter term

411* Industrial Geography
Theoretical and empirical analysis focussing on (a) locational behaviour of manufacturers and the spatial organization of the firm, and (b) industrial development (past, present, and future), including some consideration of planned economies.
_prerequisite: Geography 311* or consent of instructor
3 hours, Winter term

412* Behavioural Studies
Studies of the behaviour of individuals, groups and organizations in interaction with their environment. Emphasis will be placed on environmental perception and decision-making.
_prerequisite: One of Geography 356*, 311*, or 357* or consent of instructor
3 hours lectures, Winter term

413* Resources Management Workshop
Application of theory, methodology and techniques to research projects which focus upon natural resource management problems. Emphasizing social and economic considerations, research projects will utilize individual and group approaches.
_prerequisite: Geography 356* and consent of instructor
2 hours seminar/workshop, and field work, Winter term

414* Resources Management Workshop
Application of theory, methodology and techniques to research projects which focus upon natural resource management problems. Emphasizing social and economic considerations, research projects will utilize individual and group approaches.
_prerequisite: Geography 356* and consent of instructor
2 hours seminar/workshop, and field work, Winter term

421 Europe and the Mediterranean
Detailed study of physical, cultural, economic and political geography of Europe, 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. Interrelationships of problems among the European countries, communist or non-communist.
_prerequisite: No prerequisite
Not offered 1975-76

422* Canada
Seminar on the geographical analysis of selected Canadian development problems. Emphasis on topics of continuing Canadian concern.
_prerequisite: Geography 322* or Plan. 222* or consent of instructor
2 hours seminar, Winter term

423 Central and Eastern Europe
Detailed study of physical, cultural, economic, and political geography of Central and Eastern Europe. Geographical aspects of agricultural problems, industrialization, distribution of trade, economic planning, and relations with the Soviet Union and the West.
_prerequisite: No prerequisite
Not offered 1975-76

424* Soviet Geography
Advanced study of selected aspects of the geography of the Soviet Union. A degree of flexibility in the course allows some emphasis on topics of particular interest to the students registered in it.
_prerequisite: Geography 324* or consent of instructor
3 hours, Winter term

425* 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.
_prerequisite: Geography 325* or consent of instructor
3 hours, Winter term

426-432
In this group of courses other selected world regions will be analysed. The areas chosen will depend on faculty availability and student demand, e.g. Middle East, Latin America, U.S.A., Asia, Polar Lands and Oceania.
Not offered 1975-76
430 Field Research in Regional Geography
A detailed analysis of a selected region with major emphasis upon a field examination of the region (2-3 weeks duration) in spring.
Prerequisite: Fourth year honours geography students or consent of instructor
Not offered 1975-76

445* Advanced Political Geography
Selected topics in political geography with emphasis on the analysis of conflict and conflict-management. Discussion and lectures will provide integrating models and themes linking various case studies of conflict situations undertaken by students. The interdisciplinary nature of conflict research is emphasized while focusing on concepts and contributions within the field of political geography.
Prerequisite: Geography 345* or consent of instructor
Not offered 1975-76

449* The City as System 2
A continuation of Geography 349* with an emphasis on specific types of urban sub-systems, e.g. commercial, industrial, residential, institutional and recreational. Consideration is given to applied problems such as commercial blight, residential change, urban quality dimensions and the changing role of the public sector. Special attention is placed on individual student projects.
Prerequisite: Geography 349* or consent of instructor
3 hours, Winter term

450* Regional Urban Systems 2
A continuation of Geography 350* with an emphasis on student projects.
Prerequisite: Geography 350* or consent of instructor
3 hours, Winter term

451* Soils Geography
An analysis of the factors affecting soil development and classification. Techniques of soil survey and land classification.
Prerequisite: ES200* or consent of instructor
2 hours seminar, Fall term

452* Problems of Rural Land Use
The nature of rural land use problems, and a critical evaluation of the methods of rural land use planning. Emphasis placed on two types of geographical area; metropolitan areas and problems of land use competition, and open space planning; and under-developed or depressed rural regions and problems of alternative employment opportunities. Methods of analysis and decision-making.
Prerequisite: Consent of instructor
2 hours seminar, Winter term

460 Land Dereliction and Rehabilitation
Examination of the reasons for land dereliction, its processes, and effects. Analysis of rehabilitation techniques, includes principles of landscape architecture and optimizing ecological considerations and use of post operation areas. Students examine an area to prepare an objective and acceptable proposal in the form of a report on methods of operations and post operation rehabilitation. A small charge for field trip expenses of $15. to $20.
Prerequisite: Consent of instructor
2 hours seminar, Year

470* Air Photo Interpretation and Remote Sensing 2
Advanced air photo interpretation and its application in geomorphology, geology, resources inventory, engineering soils, hydrology, and pre-planning studies (terrain analysis). Projects in specific fields of interest form a significant part of the course. Selected topics dealing with advanced air photo interpretation techniques, remote sensing techniques, and their application.
Prerequisite: Geography 375* and Geography 300* or 302* or consent of instructor
3 hours seminar and/or lab, Fall term

471* Air Photo Interpretation and Remote Sensing 3
Data gathering from air photos by interpretation and measurement with emphasis on agricultural and urban geography. Recent advances in remote sensing (satellite photography, thermal infra-red and radar imagery, multiband imagery). Spectral analysis, image quality, image processing.
Prerequisite: Geography 375* or consent of instructor
3 hours seminar and/or lab, Winter term

475* Special Reading and Seminar on Selected Topics
Prerequisite: Honours Geography students and consent of instructor
2 hours seminar and/or tutorial, Fall and Winter terms

476 Special Readings and Seminar on Selected Topics
Prerequisite: Honours Geography students and consent of instructor
2 hours seminar and/or tutorial, Year

480* Development of Geographic Thought
Historical development of the discipline of geography; contributions of the German, French, British and American geographers in the nineteenth and twentieth centuries.
Prerequisite: 3 full credits in geography or consent of instructor
Not offered 1975-76
481* **Frontiers in Geography**
*Prerequisite: 3 full credits in geography or consent of instructor*
2 hours seminar, Fall term

482* **Geography and Education**
The foci of this course are geographical organizational concepts, educational principles and theory, and practice.
*Prerequisite: In last year of Honours or General Geography programme and consent of instructor*
Not offered 1975-76

490 **Senior Honours Research Essay**
*Prerequisite: Honours Geography students only*
3 hours seminar, Year
Department of Germanic and Slavic Languages and Literature

Associate Professor, Chairman of the Department
M. Richter, Staatsexamen(Berlin and Bonn), M.A., Ph.D.(Toronto)

Associate Professor, Associate Chairman (German)
M. Kuxdorf, B.A., M.A.(Waterloo), Ph.D.(Alberta)

Associate Chairman (Russian)
A. Donskov, B.A., M.A.(British Columbia), Dr.phil. (Helsinki)

Professors
J.W. Dyck, A.B.(Bethel), M.A.(Missouri), Ph.D.(Michigan)
E. Heier, B.A., M.A.(British Columbia), Ph.D. (Michigan)
S. Hoefert, B.A., M.A., Ph.D.(Toronto)
I. Levisky, A.B.(Rochester), M.A.(Buffalo), Ph.D. (Duke)

Visiting Professors
H. Boeschenstein, Dr.phil.(Rostock), F.R.S.C.
H. Meixner, Dr.phil.habil.(Freiburg i. Br.)

Associate Professors
G. Firnau (Mrs.) Staatsexamen (Berlin), Ph.D.(Yale)
W. Shelest, M.A.(Ottawa), Dr.phil.(München U.F.U.)
J. Whiton, B.A., M.A., Ph.D.(Minnesota)
A. Zweers, Doctorandus( Amsterdam), litt. Dr. (Groningen)

Assistant Professors
F. Jakobsb, B.A., M.A.(Manitoba), Ph.D.(Waterloo)
H.W. Panthel, B.A.(Waterloo), M.A.(Cincinnati), Ph.D.(Waterloo)

Lecturers
D. John, B.A., M.A.(Toronto)
T. Sommer (Miss), B.A., M.A.(Waterloo)
A. Strack (Miss), Staatsexamen(Tübingen and Berlin)

Dean of Women
H. Marsden (Mrs.), B.A.(Randolph-Macon), M.A. (Waterloo) (part time)

Undergraduate Course Descriptions

German

Note
During the first two years German courses are divided into two streams which allow for sequential development.

The two streams (A and B) are arranged according to a student's preparation in the language.

Stream A
Students with little or no knowledge of German

First Year
German 101/102
German 111/112

Second Year
German 201/202
German 271/272 or 300 level literature courses may be taken by Stream A or B students

Stream B
Students with at least two years of High School German (or equivalent)

First Year
German 101/102
German 111/112
German 113/114

Second Year
German 231/232
German 241/242
German 201/202

Waterloo in Germany Programme
The Department offers a programme in German language and literature at the University of Mannheim on the Rhine. The programme is open to 3rd and 4th-year students normally qualified to enrol in German courses at this level. In exceptional cases, 2nd-year students will also be considered. Students who would like to begin their studies in Mannheim in the Winter Semester (Oct. 15 to Feb. 15) must apply by April 1. The application deadline for those who would like to begin their studies in the Summer Semester (April 15 to July 15) is Feb. 1. Applications should be submitted to: “Waterloo in Germany” Department of Germanic and Slavic Languages and Literatures, University of Waterloo, Waterloo/ Ontario.

10 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.
Two terms, Lectures arranged
Open to graduate students of all departments
101* First Year German
For students with little or no knowledge of German.
(Not open to students with Ontario High School
Grade 13 German or equivalent, nor to students who
have credit for German 111*/112* or 113*/114*.)
The basic elements of German grammar with an
emphasis on oral practice and pronunciation. Lan-
guage laboratory. Introduction to aspects of German
culture and reading of appropriate graded texts.
Open to all university students
One term, 3 hours in classroom, 1 hour language
laboratory (One section, German 101A* offers more
intensive oral practice with an additional language
lab hour per week.)

102* First Year German
Course description as in German 101*.
Prerequisite: Either German 101*, 111*, 113*, or
equivalent

111* First Year German
(Science Oriented) For students with little or no
knowledge of German. (Not open to students with
Ontario High School Grade 13 German or equivalent,
nor to students who have credit for German 101*/
102* or 113*/114*.) The basic elements of German
grammar with an emphasis on reading and trans-
literation of elementary scientific literature from various
fields. The basic elements of German pronunciation.
Introduction to aspects of German culture.
Open to all university students
One term, 3 hours

112* First Year German
(Science Oriented) Course description as in German
111*.
Prerequisite: Either German 111*, 101*, 113*, or
equivalent

113* First Year German
(Business Oriented) For students with little or no
knowledge of German. (Not open to students with
Ontario High School Grade 13 German or equivalent,
nor to students who have credit for German 101*/
102* or 111*/112*.) The basic elements of German
with an emphasis on reading and translation of texts
related to business and economics.
Open to all university students
One term, 3 hours

114* First Year German
(Business Oriented) Course descriptions as in German
113*.
Prerequisite: German 113*, or equivalent

121* Introduction to German Literary Movements
Introduction to the major periods and movements of
German literature. Reading and interpretation of
short representative texts, mainly from the 19th and
20th centuries. The further development of the four
language skills (speaking, understanding, reading, and
writing) is an integral part of this course.
One term, 3 hours
Prerequisite: This course is normally for students
with at least 2 years of high school German. Other
students with equivalent knowledge of German should
obtain the permission of the instructor

122* Introduction to German Literary Movements
Course description as in German 121*.
One term, 3 hours
Prerequisite: German 121* or equivalent

151* 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.
One term, 3 hours
Prerequisite: This course is normally for students
with at least two years of high school German. Other
students with equivalent knowledge of German
should obtain the permission of the instructor

152* German Conversation and Grammar Review
Course description as in German 151*.
One term, 3 hours
Prerequisite: German 151*, 121*, or equivalent

201* Intermediate Scientific German
A review of the fundamentals of grammar is fol-
lowed by a more advanced study of language struc-
ture and idiom. Readings and translation from con-
temporary scientific writing in the Physical Sciences
with the aim of helping the student to acquire a
greater vocabulary and to master the stylistic dif-
ficulties peculiar to technical writing. The reading
material will be selected in accordance with the field
of study of the individual student.
One term, 3 lectures
Prerequisite: Either German 102*, 112*, 114*, or
equivalent

202* Intermediate Scientific German
Course description as in 201*.
One term, 3 lectures
Prerequisite: German 201* or equivalent
231* 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.
One term, 3 hours
Prerequisite: German 102* or equivalent
Students with German 281*/282* are ineligible

232* German Through Contemporary Literature
Course descriptions as in German 231*.
Prerequisite: German 231* or equivalent
One term, 3 hours

241* German Conversation and Composition
This course is a continuation of First Year German (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.
One term, 3 hours, plus one optional hour language lab
Prerequisite: Either German 102*, 112*, 114*, or permission of instructor
Not open to students who have credit for German 251*/252*

242* German Conversation and Composition
Course description as in German 241*.
One term, 3 hours, plus one optional hour language lab

251* 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.
One term, 3 hours, plus one optional hour language lab
Prerequisite: German 122* or permission of instructor
Not open to students who have credit for German 241*/242*

252* German Conversation and Composition
Course description as in German 251*.
One term, 3 hours (lectures and language lab)
Prerequisite: German 251* or equivalent

271* 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.
This course is taught in English
One term, 3 lectures
Prerequisite: None

Note
Arts students can take the preceding course in their second or subsequent year; students of other faculties, in any year (Chapter 8 for course requirements in the Faculty of Arts)

272* 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.
This course is taught in English
One term, 3 lectures

281* Post-War Literature
Reading and interpretation of major works since 1945 in prose, drama and poetry. Main authors: Brecht, Borchert, Röll, Frisch, Dürrenmatt, Grass, Eich.
One term, 3 hours
Prerequisite: German 122* or equivalent
Students with German 231*/232* are ineligible

282* Post-War Literature
Course description as in German 281*.
One term, 3 hours
Prerequisite: German 281* or equivalent

341* The Age of Goethe
(Storm and Stress, Classicism)
Reading, interpretation, and critical analysis of representative works (Goethe, Schiller, Hölderlin, etc.).
One term, 3 lectures
Prerequisite: German 122* or 232*

342 The Age of Goethe (Romanticism)
Reading, interpretation, and critical analysis of representative works (Novalis, Tieck, Brentano, etc.).
One term, 3 lectures
Prerequisite: German 122* or 232*

351* Intermediate Conversation and Composition
Conversation on modern topics. Exercises in advanced grammar, stylistics, and composition.
One term, 3 lectures
Prerequisite: German 242*, 252*, or equivalent

352* Intermediate Conversation and Composition
Course description as in German 351*.
One term, 3 lectures
Prerequisite: German 351*
Course Descriptions
Germanic and Slavic Languages and Literature

361* Young Germany and Biedermeier
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry (Grillparzer, Mörike, Stifter, Goethef, etc.).
One term, 3 lectures
Prerequisite: German 122* or 232*

362* Poetic Realism
Reading, interpretation, and critical analysis of prescribed prose, drama and poetry (Storm, Keller, Ludwig, Hebbel, Raabe, Fontane, etc).
One term, 3 lectures
Prerequisite: German 122* or 232*

371* 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.
One term, 3 lectures
Prerequisite: German 122* or 232*

372* 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.).
One term, 3 lectures
Prerequisite: German 122* or 232*

391* Masterpieces of German Literature
A study of significant prose and dramatic works of German literature from 1770 to the present. These works will be studied in groups according to themes such as: political freedom and tyranny, personal responsibility and egoism, flesh and spirit, man in society. The works studied will include titles such as Prinz von Homburg (Kleist), Woyzeck (Büchner), Thus Spake Zarathustra (Nietzsche), Death in Venice (Thomas Mann), Steppenwolf (Hesse), Metamorphosis, The Trial (Kafka), plays by Brecht, Hochhuth, Weiss and others.
This course is taught in English
One term, 3 lectures
Open to all students

392* Masterpieces of German Literature
Course description as in German 391*.
One term, 3 lectures
Open to all students

451* Advanced Conversation, Grammar and Composition
This course is conducted in German and provides intensive practice in spoken and written German on the advanced level.
One term, 3 lectures
Prerequisite: German 352* or equivalent

452* Advanced Conversation, Grammar and Composition
As 451*.
One term, 3 lectures
Prerequisite: German 451*

461* Introduction to the History of the German Language with Readings in Middle High German
One term, 3 lectures
Prerequisite: German 122* or 232*

462* Middle High German Literature
Reading and interpretation of samples from the major works of the first "Bluetezeit" in German literature (1170 to 1250) and of the Late Middle High German era (up to 1500): Early Minnesang, Heinrich von Morungen, Reinmar der Alte, Walther von der Vogelweide, Nibelungenlied, Wolfram von Eschenbach, Meister Eckhart, Oswald von Wolkenstein, Johannes von Tepl, Sebastian Brant, etc.
One term, 3 lectures
Prerequisite: German 461*
Offered in alternate years

471* German Poetry
A study of the main thoughts, themes, forms, and schools in German poetry from the beginnings to Goethe.
One term, 3 lectures
Prerequisite: German 122* or 232*
Offered in alternate years

472* German Poetry
A study of the main thoughts, themes, forms, and schools in German poetry from German Romanticism to the present.
One term, 3 lectures
Prerequisite: German 122* or 232*
Offered in alternate years

481* Humanism/Reformation
Reading, interpretation, and critical analysis of prescribed texts (Erasmus, Luther, Sachs, Bidermann, etc.).
One term, 3 lectures
Prerequisite: German 122* or 232*
Offered in alternate years

482* Baroque and Enlightenment
Reading, interpretation, and critical analysis of prescribed texts (Opiz, Gryphius, Grimmelshausen, Hofmannswaldau, Angelus Selesius, Haller, Kloppstock, Lessing, Wieland, etc.).
One term, 3 lectures
Prerequisite: German 122* or 232*
Offered in alternate years
495* 498* Reading Courses in Approved Topics
One term each, 3 lectures.
Open to fourth year students only

Course Descriptions
Germanic and Slavic Languages and Literature

**Russian**

**10 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.
Two terms. Lectures arranged
Open to graduate students of all departments

**101* First Year Russian**
(Arts 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 Russian 111*/112*
One term, 4 hours

**102* First Year Russian**
(Arts Oriented) Course description as in Russian 101*
One term, 4 hours
Prerequisite: Russian 101* or equivalent

**111* First Year Russian**
(Science Oriented) For students with little or no knowledge of Russian. Essential grammar, sentence structure. Reading and translation of scientific literature according to the students' fields of interest.
Open to all university students, except those who have credit for Russian 101*/102*
One term, 3 hours

**112* First Year Russian**
(Science Oriented) Course description as in Russian 111*.
One term, 3 hours
Prerequisite: Russian 111, Russian 101, or equivalent

**201* Scientific Russian**
A review of the fundamentals of grammar is followed by a more advanced study of the language structure and idiom. Readings and translation from contemporary scientific writing in the Physical Sciences with the aim of helping the student to acquire a greater vocabulary and to master the stylistic difficulties peculiar to technical writing. The reading material will be selected in accordance with the field of study of the individual student.
Prerequisite: Russian 102*, 112* or equivalent
One term, 3 lectures

**202* Intermediate Scientific Russian**
Course description as in 201*.
Prerequisite: Russian 201* or equivalent
One term, 3 lectures
251* Conversation, Composition, Grammar and Phonetics
This course is conducted largely in Russian and provides intensive practice in spoken Russian. Vocabulary building, comprehension, pronunciation and intonation are stressed.
Prerequisite: Russian 102*, 112* or equivalent
One term, 3 hours (lectures and language lab.)

252* Conversation, Composition, Grammar and Phonetics
As 251*.
Prerequisite: Russian 251* or equivalent
One term, 3 hours (lectures and language lab.)

261* Introduction to Russian Literary Movements
Reading of representative works from Russian Classicism, Romanticism, 19th Century Realism, and various periods of 20th century Russian literature.
Prerequisite: Russian 102* or permission of instructor
One term, 3 lectures

262* Introduction to Russian Literary Movements
As 261*.
Prerequisite: Russian 261*
One term, 3 lectures

271* Russian Thought and Culture
A survey of cultural history from 862 to 1861. Lectures will focus on major developments in literature, religion, philosophy, art, architecture, and music as seen against the background of Russia's historical past.
This course is taught in English

Note
Arts students can take this course in their second or subsequent years; students of other faculties, in any year (Chapter 8 for course requirements in the Faculty of Arts).

272* Russian Thought and Culture
A survey of cultural history from 1861 to the present. Lectures will focus on major developments in literature, philosophy, art, and music as seen against the background of Russia's historical past. Discussion will be devoted primarily to works of Russian literature.
This course is taught in English
One term, 2 lectures, 1 discussion

281* Russian Short Story
A study of the form and a detailed examination of Russian short stories by major representative writers.
Prerequisite: Russian 102* or permission of instructor
One term, 3 lectures

282* Russian Short Story
As 281*.
Prerequisite: Russian 281*
One term, 3 lectures

341* 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.
Prerequisite: Russian 102* or permission of instructor
One term, 3 lectures

342* Russian Drama
As 341*.
Prerequisite: Russian 341*
One term, 3 lectures

351* Intermediate Conversation and Composition
Written reports on prescribed themes and topics. Oral drill and translation.
Prerequisite: Russian 252* or equivalent
One term, 3 lectures

352* Intermediate Conversation and Composition
As 351*.
Prerequisite: Russian 351*
One term, 3 lectures

381* The Peoples of the Soviet Union
Especially emphasized will be the study of non-Slav peoples of the Caucasus and Central Asia, European Russia and Siberia. Czarist and Soviet policy towards national minorities, assimilation and integration problems in the light of linguistic divisions; development of literary languages. Some achievements of Soviet anthropology.
One term, 3 lectures

382* The Peoples of the Soviet Union
As 381*.
Prerequisite: Russian 381*
One term, 3 lectures

391* Great Russian Novels
Themes especially emphasized will be: the complex society, its merits, responsibility or guilt in relation to the individual; East-West confrontation; reform ideas; Nihilism; the superfluous man; tears behind laughter, etc.
This course is taught in English
One term, 3 lectures
Open to all students
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Prerequisite</th>
<th>Credit Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>392*</td>
<td>Great Russian Novels</td>
<td>From Tolstoy to Solzhenitsyn (Tolstoy: <em>War and Peace</em>, Zamiatin: <em>We</em>, Pasternak: <em>Doctor Zhivago</em>, Solzhenitsyn: <em>Cancer Ward</em>, and others). Themes as in Russian 391*. This course is taught in English.</td>
<td>Russian 102* or permission of instructor</td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>441*</td>
<td>East Slavic Epic Tradition</td>
<td>A study of the origins and development of the epic tradition in East Slavic literature as reflected in the byliny, military tales, and verse-tales from the earliest period to the end of the eighteenth century.</td>
<td>Russian 102* or permission of instructor</td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>442*</td>
<td>Russian Epic Tradition</td>
<td>Reading and critical interpretation of selected epic works from Pushkin to the present.</td>
<td>Russian 441*</td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>451*</td>
<td>Advanced Conversation, Grammar and Composition</td>
<td>This course is conducted in Russian and provides intensive practice in spoken and written Russian on the advanced level.</td>
<td>Russian 352* or equivalent</td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>452*</td>
<td>Advanced Conversation, Grammar and Composition</td>
<td>As 451*.</td>
<td></td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>461*</td>
<td>Twentieth Century Russian Literature</td>
<td>Reading, interpretation, and critical analysis of selected fiction and drama (Andreev, Bunin, Gorky, Kataev, Sholokhov, A.N. Tolstoy).</td>
<td>Russian 102*</td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>462*</td>
<td>Twentieth Century Russian Literature</td>
<td>Reading, interpretation, and critical analysis of selected fiction and drama (Arbusov, Bulgakov, Erenburg, Nabokov, Pasternak, Solzhenitsyn).</td>
<td>Russian 461*</td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>481*</td>
<td>Russian Poetry</td>
<td>A study of themes and forms of representative authors of Classicism, Romanticism (Lomonosov, Derzhavin, Pushkin, Lermontov, Nekrasov, Fet, Tiutchev, etc.).</td>
<td>Russian 102*</td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>482*</td>
<td>Russian Poetry</td>
<td>A study of themes and forms of representative authors from Symbolism to the present (Blok, Esenin, Mayakovsky, Akhmatova, etc.).</td>
<td>Russian 102*</td>
<td>One term, 3 lectures</td>
</tr>
<tr>
<td>495*-498*</td>
<td>Reading Courses in Approved Topics</td>
<td>Open to fourth year students only.</td>
<td></td>
<td>One term each, 3 lectures</td>
</tr>
</tbody>
</table>
Ukrainian

101* Beginners' Ukrainian
Basic grammar, reading, oral practice in language laboratory, translation and writing exercises.
One term, 3 hours (lectures and language lab.)
Open to undergraduate students of all departments; recommended to graduate students of Russian as a second Slavic language.

102* Beginners' Ukrainian
Course description as in Ukrainian 101*.
One term, 3 hours (lectures and language lab.)
Prerequisite: Ukrainian 101* or equivalent

201* Intermediate Ukrainian
This course will be conducted in Ukrainian and provides intensive practice in grammar, composition, and conversation.
One term, 3 hours (lectures and language lab.)
Prerequisite: Ukrainian 102* or equivalent

202* Intermediate Ukrainian
Course description as in Ukrainian 201*.
One term, 3 hours (lectures and language lab.)
Prerequisite: Ukrainian 201* or permission of instructor

301* Introduction to Ukrainian Literature
Reading and critical interpretation of texts chosen from the works of Skovoroda, Kotliarevs'ky, Shevchenko, Franko, L. Ukrainka and others.
One term, 3 lectures
Prerequisite: Ukrainian 202* or permission of instructor

302* A Critical Survey of Literary Movements in 20th Century Ukrainian Literature
With special attention to the rise of the new angry generation of poets of the Sixties (W. Symonenko, L. Kostenko, V. Korotych, and others).
One term, 3 lectures
Prerequisite: Ukrainian 301* or permission of instructor

401* Ukrainian Romanticism
Taras Shevchenko and his time. Kharkov and Kiev as literary centres; the Brotherhood of SS. Cyril and Methodius; reading and critical interpretation of prescribed prose, drama, and poetry (Shevchenko, Kostomariv, Kulish, and others).
Prerequisite: Ukrainian 402* or permission of instructor
One term, 3 lectures

402* Ukrainian Romanticism
The literary revival in Western Ukraine. A critical study of the literary movement with special emphasis on the major authors (Shashkevych, Wahylevych, Holavats'ky, and others).
Prerequisite: Ukrainian 401* or permission of instructor
One term, 3 lectures
Assistant Professors

J.A. Barbier, M.A., Ph.D.(Connecticut)


L. Grayson, B.A.(York), M.A., Ph.D.(Toronto)

R.W. Guisso, B.A.(Toronto), D.Phil.(Oxford)

P.J. Harrigan, B.A.(Detroit), A.M., Ph.D.(Michigan)

D.J. Horton, B.A.(Waterloo Lu.), M.A.(Waterloo), Ph.D.(McGill)

S.K. Johannesen, B.A.(Evangel College), M.A., Ph.D.(Missouri)

K.M. McLaughlin, B.A.(Waterloo), M.A.(Dalhousie), Ph.D.(Toronto)

W.O. Packhull, B.A.(Guelph), M.A.(Waterloo), Ph.D.(Queen's)

M.M. Sage, B.A., M.A (Michigan), M.A., Ph.D.(Toronto)

J.O. Stubbs, B.A.(Toronto), M.ScEcon.(London), D.Phil.(Oxford)

J.W. Walker, B.A.(Toronto), M.A.(Waterloo), Ph.D.(Dalhousie)

D.E. Wright, B.A.(Cambridge), Ph.D.(McMaster)

Lecturer

N. Robinson, B.A.(Toronto), A.M (Harvard)

Faculty member holds cross-appointment as shown

1 Classics

2 Sociology
Bachelor of Arts

a) General Programme
Students majoring in history should consult the General Programme requirements described in Chapter 8. They will normally choose one course from the introductory and three courses from the survey listings below. In their third year they must also take at least one course from the depth study listings (or from the Senior Seminar listings, if permitted by the instructor). The exact programme for each student will be worked out in consultation with a department advisor.

b) Honours Programme
Students taking the Honours programme in History should consult the Honours Programme requirements in Chapter 8. The exact programme for each student will be worked out in consultation with a departmental advisor.

Undergraduate Courses

Note 1
Courses offered by the History Department are divided into four basic categories to allow for sequential development. The four categories are as follows:

100 level: Introductory courses (For General and Honours credit)
200 level: Survey Courses
   Group 1
   Group 2
300 level: Depth Courses (For Honours credit only)
400 level: Senior Seminars (For Honours credit only)

Note 2
General students are reminded that they must take at least one depth course – or Senior Seminar, if granted permission – for Honours credit in order to complete their major. A student cannot take both a General and a corresponding Honours course for credit: e.g.; 213 and 277; 222* and 383B*; 223*, 224* and 265; 227*, 228* and 266.

Note 3
Half courses (meeting for one term only) are designated by an asterisk (*) after the course number. In 123, 265, 291, 295, 380, 383, and 399, students should use these numbers when registering for the full year. If registering for a half course only, use the alternative numbers: for example, 265A* (Fall), 265B* (Winter) etc.

Note 4
The G, P, R, J, sufixes indicate administered by one of the Colleges: Conrad Grebel (G), St. Paul’s (P), Renison (R), St. Jerome’s (J).

Note 5
In both undergraduate and graduate courses an instructor may grant a grade of Incomplete for a certain time in special cases, such as illness. If all the required work is not completed in the specific period, a grade is allotted. Unless a major portion of this work has been submitted this grade is normally an F. All incomplete grades are automatically turned into Fs after a lapse of seven months for full undergraduate courses, four months for graduate courses.

Introductory Courses

101 Crisis and Change in Western Civilization
Through lectures and small tutorials, this course will examine the major transformations experienced by the western world and introduce students to historical controversy and methodology. It is recommended for future honours history students as well as for students in other areas seeking an overview of the dynamics of Western Civilization.
Instructors: MacKinnon, Harrigan, Davies, Davis

101R* 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.
Fall
Instructor: Packhull

102R* Major Themes of Western Civilization 2
The development of modern nationalism and the clash of nationalism and internationalism as a theme of 20th century history.
Winter
Instructor: Packhull
103* 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.
Fall
Instructor: Walker

104* The Emergence of the Third World
Surveys the history of the social, political and economic changes which have led to the creation of new nations and the resurgence of old nations and peoples in Asia, Africa and the New World. A continuation of 103*.
Winter
Instructor: Walker, Craton

105* 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.
Winter
Instructor: Johannesen

120 An Introduction to Western Intellectual History
A foray into intellectual history, this course will explore seminal visions of the human predicament and its solution advanced by Western thinkers over the past 2,500 years. Designed for students willing to be challenged intellectually, this is a course without lectures, but with continuous readings and discussions in small seminars.
Instructors: Davies, New

123 Major Themes in Canadian History
This course examines the development of social and economic class, race and cultural relations, growth and underdevelopment, imperialism and its consequences, and the evolving Canadian state.
Instructor: Johnson

123A* Major Themes in Canadian History 1
(Part 1 of 123).
Fall

123B* Major Themes in Canadian History 2
(Part 2 of 123)
Winter

125A* 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.
Fall
Instructors: Sage, Wahl

125B* 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.
Winter
Instructors: Sage, Wahl

125C* 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.
Fall
Instructors: Barbier, Smith

125D* 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.
Winter
Instructors: Barbier, Smith
Survey Courses

Group 1
3 hours. No prerequisite. The following courses may not be taken for Honours History credit.

201* Expansion of Europe from the 15th to the 18th Century
Surveys the major explorations, conquests and settlements of the Portuguese, Dutch, French and English empires. The eighteenth-century decline of the French, Spanish and English empires in the new world is outlined.

Fall
Instructor: Patterson
Not offered in 1975-76

202* Expansion of Europe in the 19th and 20th Centuries
Surveys European expansion especially in Africa and Asia and traces the rise of the nationalist-independence movements which culminate in the end of empire in the mid-twentieth century.

Winter
Instructor: Patterson
Not offered in 1975-76

204A*-204K* Themes of History
History through thematic perspectives.

204A* Aborigines and Empires
A survey of empires and indigenous populations. Topics include administration; resistance; economic, social and political impacts and responses.

Fall
Instructor: Patterson

204B* Empires and Missionaries
A survey of missionaries as an aspect of imperialism since 1500. Native responses to evangelization will be studied. Some comparisons will be made with indigenous response to Christianity in pre-modern times.

Winter
Instructor: Patterson

204C* 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.

Fall
Instructor: Johnson

204D* History of European Urban Society
This course will focus on the demographic changes that fostered towns, industrialization and the new class alignments. It will emphasize the European experiences of the 18th and 19th centuries.

Winter
Instructor: Harrigan

204E* War and Society in the Twentieth Century
A historical examination of the effects of war on Western European societies in the twentieth century. The effects of war on politics, economics, social structure and the arts will be some of the themes investigated.

Fall
Instructor: Stubbs
Not offered in 1975-76

204F* What is History?
Examination of the assumptions and methods found in modern historical study, the relationships between history and other disciplines.

Fall
Instructor: Baker
Winter
Instructor: New

204H* 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.

Winter
Instructor: Johannesen

204K* French Canadian Personalities of the Nineteenth and Twentieth Centuries
A biographically oriented study of significant French-Canadian figures - Papineau, Tardivel, Bourassa, St. Laurent, Cardinal Leger, Lesage - emphasizing their contributions to Canadian history.

Fall
Instructor: Horton

211* 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 developments will be examined.

Fall
Instructor: Cherniavsky
212* 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.
Winter
Instructor: Wright

213 British Empire and Commonwealth History
A topical rather than chronological treatment, divided into halves on the broad themes “The British Influence” and “The Colonial Identity”. In the first term there will be sections on the institutional framework, imperial biographies and communications; in the second, sections on native peoples, colonial economics and the history of the Commonwealth.
Not open to students who have taken History 277
Instructor: Craton

214 Ireland since 1509
A study of the political, social and religious history of Ireland, with special attention to the Reformation, the 17th-century rebellions, and the 19th and 20th-century struggle for home rule and independence.
Instructor: MacGillivray

223* Canadian History to 1867
An analysis of selected issues: New France, Atlantic outlook, Loyalism and the crisis of Empire, rebellion and reconstruction, regional loyalties and the strategy of Confederation.
Not offered in 1975-76

224* Canadian History since 1867
An analysis of selected issues: westward expansion, regionalism and the crisis of Canadian federalism, framing a foreign policy, French-Canadian Nationalism, urbanization and the New Society.
Fall
Instructor: Johnson
Not offered in 1975-76

225 Canadian Culture and Society
This course will take the form of an inquiry into the nature of the Canadian experience. An examination of the social and cultural evolution of Canada from New France to the present will focus on such themes as regionalism, nationalism and imperialism.
Instructor: Grayson

225A* Canadian Culture and Society 1
(Part 1 of 225).
Fall

225B* Canadian Culture and Society 2
(Part 2 of 225).
Winter

235C* (RS 227C*) History of Christianity 1
The development of Western and Eastern Christianity to the end of the medieval period.
Fall
Instructors: Klaassen, Sawatsky

236G* (RS 228G*) History of Christianity 2
Roman Catholicism, Eastern Orthodoxy and Protestantism from the Reformation to the present.
Winter
Instructors: Klaassen, Sawatsky

Group 2
3 hours. Lectures and seminars
These courses are Honours courses, but are open to general students.

250 History as an Intellectual Discipline
This course focuses on three aspects of historical study: the history of history in the Western tradition: philosophical questions raised by the study of history; and the historian's use of social scientific assumptions and methods.
Instructors: Baker, New

255 Ancient Civilization
A survey of the social, political and economic history of Greece and Rome with an introduction to the civilization of the Ancient Near East. (Classics 251*, 252* is an acceptable alternative, but Hist 255 and C.Civ. 251*, 252* may not both be taken for credit).
Instructor: Wahl

258 History of Medieval Europe
The political, cultural, economic and ecclesiastical development of Europe from 300 to 1300.
Instructors: Cherniavsky, Mackinnon

260 Europe in Renaissance and Revolution
This course will focus on Europe in transition (1300-1600) and emphasize those political, intellectual, social and economic changes most significant to the emergence of modern Europe.
Instructor: Davis

261* Europe in the Eighteenth Century
This course hopes to bring out the characteristics of European civilization between 1680 and 1789. The first term will survey international relations, religion, politics and society in France, the Empire and Russia; the origins and impact of the Enlightenment, and the concept of Enlightened Absolutism.
Fall
Not offered in 1975-76
262* Europe in the Eighteenth Century
The second term will attempt to define the 18th century man in his cultural setting and changing attitude to the human condition by sampling his art, architecture, music and belles lettres. 
Not offered in 1975-76

263* Europe in the Nineteenth Century
A study of Europe from the French Revolution to approximately 1900 with particular emphasis on the social and intellectual forces that affected European society and the historical role of institutions in European society. 
Fall
Instructor: Harrigan

264* 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. 
Winter
Instructor: Wynne

265 Canadian History
History 265 is a survey of Canadian history from New France to the present. It is thematic rather than strictly chronological, examining the major social, intellectual and political events in the development of the Canadian nation and the Canadian people. 
Instructors: McLaughlin, Grayson

265A* Canadian History 1
(The first half of 265). 
Fall

265B* Canadian History 2
(The second half of 265). 
Winter

266 The History of Selected Racial and Regional Minorities in North America
An examination of the formative years of the Afro-Canadian, Afro-American and Native Indian communities and of the emergence of minority assertiveness and the position of minorities in modern Canadian society. 
Not offered in 1975-76
Instructor: Walker
Not open to students who have taken History 227*/228*

267G* Canadian Minorities 1: Mennonites
A study of the 200-year history of the Mennonite community in Canada: immigration and emigration, church-state relations, military exemption, internal and external separations, changing way of life, conflicts between the old and the new. 
Fall
Instructor: Epp

268G* Canadian Minorities 2: East European Groups
An examination of the backgrounds, immigration, contribution and conflicts in Canada of sub-immigrant groups as Doukhobors, Germans, Hutterites, Jews, Ukrainians. 
Winter
Instructor: Epp

269R History of Modern Revolutions
A comparative study of the French Revolution, the Russian Revolution, the World War I German Revolution, Fascism and Nazism, the Chinese Communist Revolution, Revolution in the “Third World”. Special attention will be given to respective revolutionary theories and the social changes which preceed and accompany revolutions. 
Instructor: Packhull

275* Comparative Studies in Canadian Regionalism to 1850
A comparative study of regionalism in Ontario, the Atlantic region, the Prairie West, British Columbia: the experience before 1850. 
Fall
Instructor: Cornell

276* Comparative Studies in Canadian Regionalism after 1850
A comparative study of regionalism in Canada after 1850. 
Winter
Instructor: Cornell

277 British Empire and Commonwealth History
A topical rather than chronological treatment, divided into halves on the broad themes “The British Influence” and “The Colonial Identity”. In the first term there will be sections on the institutional framework, imperial biographies and communications; in the second, sections on native peoples, colonial economics and the history of the Commonwealth. 
Instructor: Craton
Not open to students who have taken History 213
282 East Asian History
A study of the development of East Asia to the
Opium War (China) and the Meiji Restoration
(Japan), with emphasis on the distinctively oriental
societal characteristics, institutions and viewpoints.
Instructor: Guisso

284* Latin America, Colonial Period
The course will be organized around two broad
themes: "Race and Society" and "The Economics of
Colonialism". Topics will include the destruction of
Indian culture, forced labor and slavery, American
treasure and Atlantic trade, the rise of the great
estates, race mixture and eighteenth century mercan-
tilism.
Fall
Instructor: Barbier

285* 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.
Winter
Instructor: Barbier

291 African History
a) A survey of the societies, cultures and civilizations
produced by the peoples of sub-Saharan Africa from
ancient times to the colonial period. b) A study of
sub-Saharan Africa from the establishment of col-
nlunal rule to the present, with particular attention to
the African response to European control and to con-
temporary issues in independent Africa.
Instructor: Walker

295 History of the United States
A survey of American society, politics and thought,
and of the relations of the United States with the
outside world from 1776 to the present.
Instructors: Johannesen, Ostrander

295A* History of the United States, 1776-1865
(Part 1 of 295)
Fall
Instructor: Johannesen

295B* History of the United States, since 1865
(Part 2 of 295)
Winter
Instructor: Ostrander

284 East Asian History
A study of the development of East Asia to the
Opium War (China) and the Meiji Restoration
(Japan), with emphasis on the distinctively oriental
societal characteristics, institutions and viewpoints.
Instructor: Guisso

284* Latin America, Colonial Period
The course will be organized around two broad
themes: "Race and Society" and "The Economics of
Colonialism". Topics will include the destruction of
Indian culture, forced labor and slavery, American
treasure and Atlantic trade, the rise of the great
estates, race mixture and eighteenth century mercan-
tilism.
Fall
Instructor: Barbier

285* 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.
Winter
Instructor: Barbier

291 African History
a) A survey of the societies, cultures and civilizations
produced by the peoples of sub-Saharan Africa from
ancient times to the colonial period. b) A study of
sub-Saharan Africa from the establishment of col-
nlunal rule to the present, with particular attention to
the African response to European control and to con-
temporary issues in independent Africa.
Instructor: Walker

295 History of the United States
A survey of American society, politics and thought,
and of the relations of the United States with the
outside world from 1776 to the present.
Instructors: Johannesen, Ostrander

295A* History of the United States, 1776-1865
(Part 1 of 295)
Fall
Instructor: Johannesen

295B* History of the United States, since 1865
(Part 2 of 295)
Winter
Instructor: Ostrander

304 East Asian History
A study of the development of East Asia to the
Opium War (China) and the Meiji Restoration
(Japan), with emphasis on the distinctively oriental
societal characteristics, institutions and viewpoints.
Instructor: Guisso

384 Latin America, Colonial Period
The course will be organized around two broad
themes: "Race and Society" and "The Economics of
Colonialism". Topics will include the destruction of
Indian culture, forced labor and slavery, American
treasure and Atlantic trade, the rise of the great
estates, race mixture and eighteenth century mercan-
tilism.
Fall
Instructor: Barbier

385 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.
Winter
Instructor: Barbier

391 African History
a) A survey of the societies, cultures and civilizations
produced by the peoples of sub-Saharan Africa from
ancient times to the colonial period. b) A study of
sub-Saharan Africa from the establishment of col-
nlunal rule to the present, with particular attention to
the African response to European control and to con-
temporary issues in independent Africa.
Instructor: Walker

395 History of the United States
A survey of American society, politics and thought,
and of the relations of the United States with the
outside world from 1776 to the present.
Instructors: Johannesen, Ostrander

395A* History of the United States, 1776-1865
(Part 1 of 295)
Fall
Instructor: Johannesen

395B* History of the United States, since 1865
(Part 2 of 295)
Winter
Instructor: Ostrander

340 Roman History to 337 A.D.
A study of Roman history with particular emphasis
on the social and constitutional crises of the republic
and the legal and governmental institutions of the
empire.
Instructor: Wahl
Not offered in 1975-76

343G* 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 History 347G*
Fall
Instructor: Klaassen
Not offered in 1975-76

344G* Mystical and Utopian Movements from the
12th to the 17th Century: 2
A study of the Utopian theme from the German
Peasant Revolt to the fifth Monarchy Men including
More’s Utopia and several other lesser known
statements.
Alternates with History 348G*
Winter
Instructor: Klaassen
Not offered in 1975-76

347G* Radical Reformation 1 (also RS 321G*)
A study of spokesmen for radical reform of the
church, including Andreas Carlstadt, Thomas
Muntzer, Caspar Schwenckfeld, Sebastian Franck
and Michael Servetus.
Alternates with History 343G*
Fall
Instructor: Klaassen

334
348G* Radical Reformation 2 (also RS 322G*)
A study of Anabaptism and its place in the history of the Christian church and of the Reformation period.
Alternates with History 344G*
Winter
Instructor: Klaassen

351A*, 351B*, 351C*, 351D* Special Subject
Seminars and lectures in special fields. (See current department brochure for further information).

352 The United States in World Affairs
An analysis of American foreign policy in the nineteenth and twentieth centuries.
Instructor: Eagles

353 Medieval Church History from 312-1449
A study of the evolution of the dogmatic approach. Topics will include dogmatic moral and political questions which affected the teaching of the church.
Instructors: Wahl, Sage

355* 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.
Fall
Instructor: Davies

356* 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.
Winter
Instructor: Davies

357* German History 1648-1871
From the Great Elector to Bismarck. The growth of Prussia from scattered domains to the dominating element in a new Reich.
Fall
Instructor: Wynne

358* German History 1871-1950
The German Odyssey from unification to a divided Germany. From the empire of William I to the Weimar Republic and Hitler's Third Reich.
Winter
Instructor: Wynne

359* France in Revolution 1780-1870
A study of French society and the four revolutions that affected it with particular attention to social and institutional forces.
Fall
Not offered in 1975-76
Instructor: Harrigan

360* French History Since 1870
A study of France from 1870 to the present with particular emphasis on the political and intellectual forces that affected French society.
Winter
Instructor: Baker
Not offered in 1975-76

361 English History 1485-1660
A study of achievements and crises in the Tudor and early Stuart periods.
Instructor: MacGillivray

362 British History Since 1760
A study of society, politics and thought in the world's first industrialized state.
Instructor: Wright

363 Medieval English History
A study of government, church and society.
Instructor: Cherniavsky

364 Spain and Portugal Since 1469
The development of the Old Regime, the relations of Spain and Portugal with the outside world, the rise of liberalism, and the destruction of the bourgeois political order. The course will terminate with an examination of the Spanish Civil War and the contemporary "corporatist" regimes.
Instructor: Barbier

366 European Intellectual History
Major themes in European thought and culture since the 17th century, with an emphasis on the emergence, transformation and decline of Enlightenment perspectives and the contemporary search for alternatives.
Instructor: Baker

367R* A History of War 1
A history of warfare from ancient to modern times with special focus on the social setting and social effects of wars on western society and its history. Students will be encouraged to pursue topics of special interest.
Fall
Instructor: Packhull

368 International History Since 1870
A study of the international relations of the European states with due regard to non-European influences on diplomatic history during this period.
Instructor: Stubbs
Not offered in 1975-76
369R* A History of War 2
A history of modern warfare since the French Revolution. The evolution of unconventional warfare in its economic, social and technological setting. Writings on revolutionary and guerrilla warfare, will be examined in historical perspective. Students will be encouraged to pursue topics of special interest.

*Winter
Instructor: Packhull

370 West Indian History
A study of the circum-Caribbean region from aboriginal times paying particular attention to the impact of European imperialism on the indigenous people, a comparison of the various types of European imperialism, the history of plantations, slavery and slave society, independence movements, and the problems posed by modernisation, underdevelopment and neo-colonialism.

*Instructor: Craton

372 Problems in African History
A study of specific themes and outstanding questions in African history. Intended primarily for students who have taken History 291 or its equivalent and who wish to pursue an examination of Africa's past and present condition in greater depth.

*Instructor: Walker

374G* 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.

*Fall
Instructor: Epp

375 History of China
The continuation of History 282. Particular attention will be devoted to responses to the technically sophisticated cultures of the West; modernization; reform and revolution; modifications of Communism and democracy; the development of the People's Republic.

Prerequisite: History 282
*Instructor: Robinson

380 Canada 1867-1967
This course will examine (a) the development of a "national consensus" in British North America after Confederation. Continentalism, Imperialism, Bi-culturalism and Economic nationalism will be major themes. (b) Canada's emergence as a 20th century nation.

*Instructor: Cornell

380A* Canada, 1867-1914
(Part 1 of 380)

*Fall

380B* Canada Since 1914
(Part 2 of 380).

*Winter

382 Canadian Intellectual History
An historical analysis of Canadian culture, both nationally and regionally.

Not offered in 1975-76
*Instructor: English

383 History of French Canada
The course will emphasize social and economic issues in the development of French Canada and the emergence of modern Quebec.

*Instructor: Horton

383A* History of French Canada to 1867
The course will emphasize social and economic issues in the development of French Canada to Confederation.

(The first half of 383, for students taking only the Fall half-term.)

*Fall

383B* History of French Canada Since 1867
The course will treat the emergence of modern Quebec, with special emphasis on social and economic issues.

(The second half of 383, for students taking only the Winter half-term.)

*Winter

384 Canada in Crisis
A study of social movements in Canada during the interwar years, 1919-1940. The course will emphasize a comparative analysis of the underlying assumptions, overt goals and active participants in such movements as the social gospel, the Progressives and the C.C.F.

*Instructor: Grayson
Not offered in 1975-76

386 Ontario History to Confederation
The course will examine the growth of Ontario from a pioneer settlement, with particular emphasis on economic, social, political and cultural aspects of change. An emphasis will be placed on the sources and method of local historical research.

*Fall
Instructors: English, McLaughlin
387* 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.
Winter
Instructors: English, McLaughlin

388 History of Canadian American Relations
An examination of the history of relations between the two countries. Topics of a political, economic, social and cultural nature will be studied.
Instructor: Grayson

389 Canada in World Affairs: The Twentieth Century
An analytical and historical examination of Canadian foreign policy in the international system: domestic sources of Canadian foreign policy; the international system as a source of Canadian diplomacy; the "linchpin" thesis and pre-1939 policy.
Instructor: English
Not offered in 1975-76

390 History of North American Indians
An examination of the main themes in the history of the Indians of Canada since 1600. Some attention will also be given to the Indians of the United States comparing their history with that of the Canadian Indians.
Instructor: Patterson

392 Colonial American History
The development of an American civilization with emphasis on colonial and Revolutionary origins. Selected topics in social and intellectual history will be explored in depth.

393 History of American Nationalism 1790-1920
The study of cultural nationalism, expansionism, sectionalism, imperialism, anti-imperialism and the idea of "the American mission" in the world.
Instructor: Ostrander

394 Twentieth Century Latin America
A topical examination of Latin America's historical experience in this century. A thematic approach will be followed.
Instructors: Barbier, Smith

395 Law in the Ancient World
An historical survey of the laws of the Ancient Near East, Greece and Rome. This course will attempt to give the student an appreciation of law through a study of its early history, and to examine the ancient world from a distinctive point of view.
Alternates with History 397
Instructor: Wahl
Not offered in 1975-76

397 The Origins of the Common Law
An historical study of the origins and development of the Common Law. Topics in the history of Civil and Canon Law will be discussed to provide an introduction to the legal concepts of the Middle Ages and to give an appreciation of law as it exists today.
Alternates with History 395
Instructor: Wahl
Not offered in 1975-76

399 Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.

399A* Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.
Fall

399B* Directed Studies in Special Topics
Study in a limited field under tutorial guidance. A high standard of written work will be expected.
Winter
Senior Seminars

3 hours. Seminars and consultations. These seminars are designed for third and fourth year students who have taken relevant survey or depth courses, their equivalent elsewhere, or related courses in other disciplines. In all cases the instructor's permission is required.

The following seminars will not be offered in 1975-76: 413, 422, 428, 431, 436.

400 Roman History; Keresztes
401 Medieval History; MacKinnon
405 The Intellectual History of the Renaissance and Reformation; Davis
410 Early Modern English History; New
411 English History from the 17th to the 19th Century; MacGillivray
412 19th and 20th Century British History; Wright
413 Modern French History; Harrigan
414 Modern European Intellectual History; Baker, Harrigan
415 Modern German History; Wynne
418 Russian History since 1861; Davies
420 Canada in the 19th Century; McLaughlin
421 Ontario History; Cornell
422 France and Its Atlantic Empire in the 18th Century; Horton
423 Modern Quebec; Horton
425 Canadian Cultural History; Masters
426 Colonial American History; Johannesen
427 19th Century United States History; Ostrander
428 Modern American History; Eagles
429 Modern Latin American History; Smith
430 British Imperial and Colonial History; Craton
431 Colonial Latin American History; Barbier
432 African History; Beachey
435 The History of Native Response to Colonial Rule; Patterson
436 Black History in North America; Walker
450 Marxism and Canadian History; Johson
453 20th Century International History; Stubbs

Other Senior Courses*

These courses are limited to senior Honours students.

465 The History and Theory of Historical Writing
3 hours. Lectures and seminars. (For Make-up year students only)

491 Directed Studies in Special Topics
Senior students only
* Not counted as Senior Seminars
Department of Human Relations and Counselling Studies

Professor, Chairman
J.S. Minas, B.A.(Wayne), Ph.D.(Illinois)

Professors
G.T. Barrett-Lennard, B.Sc., B.A.(Western Australia), Ph.D.(Chicago)
I.M. Butler, B.Sc., Ph.D.(Minnesota)
J.A. Dyal, B.A.(Oklahoma), Ph.D.(Illinois)
M. Lerner, B.A., M.A.(Ohio State Univ.), Ph.D. New York University
A.H. Mahar, B.S.(Western Reserve), M.A., Ph.D. (Ohio State)

Assistant Professors
M. Forest, B.A.(New York), M.A.(Columbia), Ed.D. (Massachusetts)
J. Goldstein, B.A.(McGill), M.A.(Columbia), Ph.D. (Chicago)
R. O'Day, B.A.(British Columbia), M.A., Ph.D. (Michigan)
A.S. Wiener, B.A.(New Jersey), Ph.D. (Wright Institute, California)

Adjunct Professors
S.S. Appleton, B.A., M.D.(Toronto)
R.K. Bieman, B.A.(Yeshiva), Ph.D.(SUNY, Buffalo)
W.W. Dick, B.A., B.D.(Toronto), M.A., Ph.D. (Ottawa)
J. Forest, B.A.(Montreal), Ed.D.(Massachusetts)
C.A. Guldner, B.A., Th.M., Th.D.(Denver)
D.A. Guldner, B.A., M.R.E.(Denver)
O. Weizmann, B.A.(Ohio State), Ph.D.(Illinois)
J.L. Williams, B.A., M.A.(Alberta), Ph.D.(Missouri)
J.J. Wine, B.A.(Bridgewater College), M.S.(Iowa State), Ph.D.(Alberta)

Special Lecturers
D.W. Groff, B.A.(Western Ontario), M.Sc.(Guelph)
R.L. Knight, A.B.(Antioch)

Faculty members holding cross appointments as shown
1 Cross appointment in Philosophy
2 Cross appointment in Psychology
3 Cross appointment in Counselling Services
4 Cross appointment in Renison College

The department and its programme are interdisciplinary in staff and scope. The interdisciplinary effort is centered about the concepts of development and change, individual change in dyadic and group situations, change and organizational processes in groups, and in social change.

The department emphasizes efforts to understand the person as such, and the person in the context of group, institutional, and social structure. It has, therefore, a humanistic perspective aspiring to illuminate and contribute to the quality of human living. Personal development and humanistically oriented institutional and social development constitute a major axis of concern in the programme. These aspects of the orientation of the department are reflected in its educational and research components, and in the developing involvement of programming members in activities and projects in the larger community.

The department seeks to achieve a fusion of scholarly, scientific humanistic, and social values and activities. Integration of knowledge and values is seen as an essential condition for adequate response to human and social problems.

To fulfill the requirements for a general degree in Human Relations and Counselling Studies a student must complete 120*, 201*, 202*, 230*, and a minimum of three additional full-year courses or equivalent in the Department. See also the calendar section dealing with the General Programme requirements of the Faculty of Arts (page 84). Students intending to major in Human Relations and Counselling Studies should consult the Undergraduate Officer of the Department as early as possible in order to plan related elective courses in other departments.
Undergraduate Course Descriptions

100* Human Relations in Contemporary Life
An exploratory introduction to the field of human relations with emphasis upon contemporary life and conditions. A survey of principles of human relations as they relate to such contemporary topics as family life, human potential and development, the meaning of work, education, technology, and social change.
3 hours. No prerequisite

120* Concepts of the Person and Human Nature
Models and conceptions of the nature of man. A study of approaches to understanding human nature in its social context.
3 hours. No prerequisite

201* Counselling Process and Personal Facilitation
An introduction to theory, method, and resource development in personal counselling.
3 hours. No prerequisite

202* Counselling Process and Personal Facilitation 2
A continuation of 201*
3 hours. Prerequisite: Human Relations 201*

220* Small Group Processes
Study of intensive group experience, process patterns and effects — with special reference to groups intended to facilitate personal and relational learning. Class sections will be small to permit direct learning from experience and observation as well as from discussion, research and writing in the field.
3 hours. Prerequisite: Consent of instructor

230* Human Relations Counselling and Organizational Processes
Organization as systems of human relations. Case-studies, for example, industrial, educational, and human service organizations, with comparison of differing systems. Human relations analysis of organizations and the concept of intrinsically beneficial systems. Counsellors and change-agents as organizational "helpers."
3 hours. Prerequisite: Psychology 253*, Sociology 212* or consent of instructor

252* Models of Human Community
Visions of ideal or alternative human communities. Significant attempts in deliberate creation of such communities. Learnings from experiments and practice in special communities. Problems in the design of communities for human well-being, emphasizing aspects of personal and communal life. Inquiry toward a concept of optimal community.
3 hours. Prerequisite: Consent of Instructor

Course Descriptions
Human Relations and Counselling Studies

273* The Politics of Modern Humanism
A broad attempt to delineate and understand the origins of contemporary humanism with special emphasis on the institutions and philosophy of humanism in Canada. By way of an examination of the humanistic perspective, readings will be selected from among the following: Freud, Fromm, Maslow and Szasz.
No prerequisite
3 hours

282* The Personal Dimensions of Inequality
An in-depth interdisciplinary analysis of the personal dimensions and consequences of social systems and relations which create, maintain and exacerbate inequalities that hinder and cripple existential growth and human development.
No prerequisite
3 hours

300* Psychohistory and Personal Identity
An examination of how the creation of personal meaning and identity is affected by authoritarianism and movements for social liberation. Exploration of the personal impact of encounters with authoritarian systems and libertarian movements. Readings from some of the following: Bettelheim, Coles, Erikson, Fanon, Keniston, Lifton, Marcuse, Reich, and Vallieres.
Prerequisite: Consent of instructor
3 hours

320* The Self-Analysis Group
The primary focus will be on understanding covert processes which operate in groups and which may facilitate or hinder functioning of innovative change and development. The course is designed to provide the participants with opportunities to experience directly and to analyze the effects of authority upon themselves and others.
Prerequisite: HR&CS 201* and consent of instructor
3 hours

328* Self Change
A study of such methods of self change as: meditation, contemplation, relaxation, self-analysis, dream work, behavioral self control, and bio-feedback. A survey of theories of self change in personal counselling, and the interaction between self change and social change.
Prerequisite: HR&CS 120*, 201* or consent of instructor
3 hours
355* Experiential Foundations of Counselling Studies
An examination of the work of Gendlin, Perls, Binswanger, May, Rogers, Boss, Whitaker and other contributors to experiential foundations of counselling. Dyadic and group counselling theory and practice from such experiential approaches as Gestalt, existentialism, and Daseins-analysis.
Prerequisite: HR&CS 120*, 201* or consent of instructor
3 hours

370 (a, b, c)* Selected Social Projects
Students will work collectively on a social project to be selected each year; projects may include work with welfare recipients, mental patients, prisoners, etc. Class work will stress the development of more effective, accountable, and humane social services in the light of an emphatic understanding of those whom human service professionals aim to help.
Prerequisite: For H.R. & C.S. majors only; consent of instructor
3 hours, credit basis only (CR/F)

380 (a,b,c)* Special Subjects
To be offered at different times as announced by the Department.
3 hours. Prerequisite: Consent of instructor

390 (a,b,c)* Directed Reading
Specially arranged for individual students.
3 hours. Prerequisite: Consent of instructor

501* Naturalistic Research
An introduction to naturalistic research in areas in which it may be impossible, undesirable or impractical to engage in controlled experimentation. Discovery and refinement of hypotheses will be stressed since they are intrinsic to naturalistic research. A model for naturalistic research and analysis will be presented.
3 hours. Prerequisite: Consent of instructor
Inter-Faculty Studies

Arts 100 Communications
An examination of the origins, evolution, and future dimensions of communications media designed to facilitate an understanding of adequacies and inadequacies of media, to relate them to the purposes of human awareness, and to explore needs and means of maintaining accountable controls over the media. The course seeks to assist students in discovering the range of informational, research and exploratory resources open to them; in gaining some preliminary experience in utilizing such sources; and in applying a critical judgment to material secured. (Arts 100 is a multi-media course offered in part on Channel 19 T.V.)

Arts 120*/121* Focal Issues in Contemporary Society
An attempt to bring together and condense what are believed to be essential elements of the several social science disciplines. The core of the study is a group of selected contemporary issues with implications that cut across the various disciplines. An effort will be made to discuss values appropriate for our age. Integrating concepts are personality and culture. (Among specific issues discussed are race, class, violence, pollution, youth culture, family, the new consumerism and democracy. Regular lectures and discussions will be supplemented by films, visiting lecturers, student-directed research and role-playing.)
3 lectures. Winter term

IFS 201* Student-Initiated Workshops on Technological and Social Problems (WOTASP)
Workshops on Technological and Social Problems have been established to increase University involvement in seeking solutions to urgent technological and social problems, and to develop in students the ability to work with fellow students from a variety of disciplines in defining complex problems, demonstrate resourcefulness in obtaining relevant information and evaluate the merits of alternative solutions with a view toward constructive utilization of the findings. Workshops are to be student-initiated, planned and directed.
Not offered 1975/76

IFS 220 Social Philosophy and Social Justice
This course provides partly an introduction to, and partly an overview and synthesis of, social philosophy and the social sciences. The unifying themes are the continued emphasis on normative questions and foundational and methodological questions about social philosophy and social science. Although all the social sciences are touched upon, somewhat more emphasis is given to politics, economics, sociology and anthropology than to psychology as such. In general, questions are raised via normative issues, especially the issues of social justice, and through interaction the idea of social planning becomes prominent.
Winter term
4 hours (2) 2-hour sessions per week
Not offered in 1975/76

IFS 230* Nonviolence 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. (First-year students admitted with permission of the instructor.)
Winter term
3 hours

IFS 240* Man, Leisure, and Society
Leisure from both historical and contemporary perspective; leisure as viewed by the Utopians - the dream versus the reality; as a class phenomenon; as non-work; as culture-pop and otherwise; and as a problem. Leisure and social institutions; the family, the school, the church, the polity, the economy. Leisure and the future of man.
Winter term
3 hours

IFS 300 Media Writing Exposition
An examination of the terms and forms of expression characteristic of non-fiction presentation in the media of print, radio and television. Lectures, seminars and workshops will be combined to seek to establish basic criteria for media expositions, to assess them and apply them to individual student projects.
To be offered only if enrollment exceeds 15
3 hours
Department of Kinesiology

Assistant Professor, Acting Chairman of the Department, Associate Dean of Undergraduate Affairs for the Faculty of Human Kinetics and Leisure Studies
W.N. Widmeyer, B.A. (Western Ontario), B.P.E. (McMaster), M.A. (California)

Professor, Dean of the Faculty of Human Kinetics and Leisure Studies
G.S. Kenyon', B.P.E.(UBC), M.S.(Indiana), Ph.D.(N.Y.U.)

Associate Professor, Associate Chairman Graduate Affairs
B.D. McPherson', B.A., M.A.(Western Ontario), Ph.D.(Wisconsin)

Assistant Professor, Associate Chairman Undergraduate Affairs
M.E. Houston, B.Sc.(Toronto), Ph.D.(Waterloo)

Professor

Associate Professors
D. Hayes, B.Sc., B.P.E., M.Sc., D.P.E.(Springfield)
D.A. Winter, B.Sc., M.Sc.(Queen's), Ph.D.(Dalhousie)

Assistant Professors
P.J. Bishop, B.Sc., B.P.E.(Waterloo), M.Sc.(Western Illinois), Ph.D.(Minnesota)
H.J. Green, B.A., B.P.H.E.(Queen's), M.A.(Alberta), Ph.D.(Wisconsin)
H.W. Gruchow, B.S., M.S., Ph.D.(Wisconsin)
K.C. Hayes, Dip.P.E.(St. Lukes College), M.S., Ph.D.(Massachusetts)
P.G. King, B.P.E.(UNB), M.Sc., Ph.D.(Alberta)
R.W. Norman, B.A., B.P.E.(McMaster), M.Sc.(Alberta)
C.H. Fierce, B.A.(Grinnell), M.A.(De Pauw), Ph.D.(Kansas)
R.E. Friddle, B.P.H.E.(Toronto), M.A.(Springfield)
R.P. Schlegel, B.A.(Western Ontario), M.Sc.(Illinois), Ph.D.(Ohio State)
M.T. Sharratt, B.A., M.A.(Western Ontario), Ph.D.(Wisconsin)
J.A. Thomson, B.A., M.Sc.(McMaster), Ph.D.(Waterloo)
I.D. Williams, M.S., Ph.D.(Illinois)

Lecturers
G.H. Baycroft, B.P.E., M.Sc.(Alberta)
R.D. Graham, B.A., M.A.(Western Ontario)

Adjunct Professors
J.A. Israel, M.D.(Toronto), FRCS(C) (Toronto)
D.J. Pugliese, B.A., B.P.E.(McMaster), Ed.M.(Buffalo)

Faculty member holds cross appointments as shown
'Sociology
'Psychology

Undergraduate Course Descriptions

Courses in Kinesiology, Health Studies and Dance are offered within the Department of Kinesiology. Descriptions of Health Studies and Dance courses follow those for the Kinesiology courses below. For details of programmes in all three areas see Chapter 11.

Kinesiology

102* Bio-physical Basis of Kinesiology
The study of human physical movement from mechanical, anatomical and physiological viewpoints is discussed. The course provides a general orientation to the study of Kinesiology.
2 lectures, 1 tutorial, Fall term

103* Psycho-social Basis of Kinesiology
The study of human physical activity, from psychological, sociological and aesthetic perspectives is examined.
2 lectures, 1 tutorial, Winter term

116* Organic Chemistry
An introduction to fundamentals in general and organic chemistry.
3 lectures, Winter term

171* History of Sport and Physical Activity
A cultural historical review of the development of sport and physical activity from the early Greek period to modern times. Special emphasis is placed on the development of sport in Canada since 1900 and the role of physical activity of all kinds in today's society.
May not be offered in 1975
3 lectures, Winter term
200* Human Anatomy
A study of the human anatomical systems and their integration. Particular emphasis is placed on the skeletal, articular and muscular systems.
Prerequisite: Kinesiology students or permission of instructor
3 lectures, 2 hours lab, Fall term

205* Physiology of Exercise
An examination of the transient and persistent effects of exercise on physiological functions. Topics include muscular and cardio-respiratory function and the effects of varying environments upon their performance.
Prerequisite: Honours Dance students only
3 lectures, 3 hours laboratory in alternating weeks, Winter term
Not offered in 1975

222* 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.
Prerequisite: Kinesiology students only
3 lectures, 2 hours laboratory
Fall term

280* Administration
A study of the principles underlying general administrative behaviour with an emphasis upon understanding the role and mechanics of decision making. Case study analysis and practical project work are utilized to foster the development of the student's administrative technique.
3 lectures, Winter and Spring terms

300* Physiology of Physical Activity (Part 1)
A study of the effects of physical activity on the muscular, circulatory and respiratory systems and the mechanisms through which the body adapts to activity and environment.
Prerequisites: Biology 303*, 304*
3 lectures, 2 hours lab, Fall term

317* 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.
Prerequisite: Kinesiology 116* or equivalent
3 lectures, Fall term

321* 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.
Prerequisite: Physics 103*, Kinesiology 200* and 222*
3 lectures, 2 hours laboratory, Winter and Spring terms

330* 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.
Prerequisite: Kinesiology students only
3 lectures, Fall and Spring terms

335* Evaluation of Human Motor Performance
The nature and methodology of assessment is reviewed from theoretical and empirical perspectives. Taxonomies of motor performance are examined and principles developed for the measurement of specific constructs in field and laboratory situations.
Prerequisite: Kinesiology 222*
3 lectures, 2 hours laboratory, Winter and Spring terms

340* 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.
Prerequisites: Kinesiology 200*, 3rd and 4th year students only
3 lectures, 2 hours laboratory, Winter and Winter terms

341* Selected Topics in Sports Medicine
A course for those students wishing additional study in the area of athletic medicine. Topics to be presented include trauma to the head and vertebral column, internal injuries, heat problems and the medical and non-medical use of drugs in sport.
Prerequisites: Kinesiology 340*, 300*, 317*
3 lectures, 2 hours laboratory, Winter term

346* Nutrition (Health Studies 346*)
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Prerequisite: Kinesiology 317* or equivalent
3 lectures, Winter term
352* 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.
Prerequisites: Sociology 101* and one other Sociology course
3 lectures, Fall and Spring terms

353* Personality and Motivation in Physical Activity (formerly 451*)
An application of major psychological theories to the central problems of sport and physical activity. Current research in the area is examined. Major emphasis is placed upon gaining an insight into those psychological factors influencing performance and behaviour of the sport participant.
Prerequisites: Psychology 101*, and one other Psychology course
3 lectures, Fall term

354* Group Processes in Physical Activity (formerly Kin 455)
An examination of the social influences and group processes which occur within sport teams. Topics include conformity, the influence of onlookers and co-actors, leadership, group structure, and cohesion.
Prerequisite: 2 term courses in Psychology, or consent of instructor
3 lectures, Winter and Spring terms

355* Motor Learning
An introduction to the concepts and theories of learning motor skills. Laboratory sessions enable the student to participate in a variety of commonly used experimental procedures which relate to concepts and theories presented in lectures.
Prerequisite: Kinesiology 222*
3 lectures, 2 hours laboratory, Winter term

356* Information Processing in Human Perceptual Motor Performance
An information processing model of perceptual-motor behaviour is presented. Human performance theory is used to study those 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. Principles derived from the model are applied to the teaching of motor skills, the study of mental retardation and the study of skill deterioration in old age.
Prerequisite: Kinesiology 355* or consent of instructor
2 lectures, 1 tutorial, Winter, Spring terms

401* Physiology of Physical Activity (Part 2)
A study of the metabolic and environmental aspects of exercise, fatigue, training, and physical fitness. Work capacity in relation to age and sex is examined.
Prerequisites: Kinesiology 300* and 317*
3 lectures, 2 hour lab, Winter and Spring terms

405* Applied Kinesiology
Principles of physiology and movement analysis as they apply to the development of maximal human motor performance are examined. Consideration is given to the effects of environmental, psychological and social factors on such development. Intended for students not electing Kinesiology 401*.
Prerequisite: Kinesiology 300* and 321*
3 lectures, 2 hours lab, Winter term
Not offered in 1975

410* Growth, Development and Aging (Health Studies 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 development is examined.
Prerequisites: Kinesiology 200* and Biology 303*
3 lectures, Fall and Spring terms

420* Kinesiological Considerations in Equipment Evaluation
The principles of evaluation and design of equipment for human use are studied from a kinesiological perspective.
Prerequisites: Kinesiology 321* and 340*
3 hours lecture, Field trips, Fall term

422* Administration of Facilities
A study of the problems involved in the planning and maintenance of various athletic plants used by schools and recreation agencies and the selection and care of the equipment and supplies used with these facilities.
3 lectures, Fall and Winter terms
Will not be offered 1975 through 1976

425* 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.
Prerequisite: Kinesiology 321*
3 lectures, 2 hours laboratory, Fall and Spring terms
431*/432* Research Project
An independent research project on an approved topic, supervised by a faculty member. Required of all students enrolled in Honours and General programmes in Kinesiology. Kinesiology 431* includes an approved design and the completion of the first segment of the paper. 
Prerequisites: 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. Kinesiology 432* includes the completion of the project begun in Kinesiology 431*.
Prerequisite: Kinesiology 431*

442* Adapted Physical Activities
The study of individual problems and their implications for the Kinesiologist. Body mechanic problems, orthopaedic disabilities, neurological disabilities, psychologic disorders, heart disturbances and nutritional problems are discussed in depth.
Prerequisite: Kinesiology 200*
2 lectures, 2 hours lab., Winter term

452* Sport in Society (Recreation 303* Sociology 374*)
An introduction to the sociology of sport. Utilizing the major frames of reference of the social sciences, the function of sport in contemporary society is examined.
Prerequisite: Sociology 101* and one other Sociology course
3 lectures, Winter and Spring terms

453* The Psychology of Sport and Physical Activity
This course focuses on the effects of participating in physical activity programmes upon the socio-psychological adjustment of the individual. Although attempts are made to show how common sports and physical activity situations generally influence development and adjustments, emphasis is given to the uniqueness of the individual personality and how a person reacts to different situations.
Prerequisite: Kinesiology 353*
3 hours lecture, Winter term

470* 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.
Prerequisite: 4th year Kinesiology students
3 hours, Winter and Spring terms

472* 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.
Prerequisite: Consult with department
Fall, Winter and Spring terms

489* 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 — Acquatics, Kin - 489T - Track and Field. Students must complete a minimum of three (3) sport sections before credit is given.
Prerequisite: 3rd and 4th year Kinesiology students only
9 separate sections: Fall, Winter, and Spring terms

Physical Activities Courses
Instructional courses at basic and advanced levels for over twenty sports are available to all Kinesiology students. Detailed listings are available at the time of pre-registration. In addition, outdoor camping and ski schools are offered to upper year students. A nominal charge will be made to cover the extra costs of these two schools.
All activity courses are elective and non-credit.
Students should consult with a faculty advisor concerning requirements in this area for entry into careers such as teaching.
Health Studies

140* Foundations of Health Science 1
A survey course directed towards the health of man — conception through youth. Topics include conception (prediction, control, genetics), early growth and development, puberty and adolescence, fitness, nutrition, consumer behaviour, and lifestyle determination. 
3 hours lectures, Fall term

141* Foundations of Health Science 2
A survey course directed towards the health of man — middle age through death. Topics include family planning, cancer, cardiovascular and systemic diseases, transplants, accidents, fitness, aging, and death.
3 hours lectures, Winter term

240* Man Adapting
A study of human biological variation in relation to various physical, biological, and social environmental influences, with emphasis on the relevance of these factors to health and disease.
3 hours lectures, Fall term

241* Epidemiology
An investigation of the communicable and non-communicable diseases of man. The etiology, duration, and severity of selected diseases are studied, along with resistance and immunity: natural and artificial.
3 hours lectures, Winter term

302* An Introduction to Biomathematics
(Mathematics 302)
Course material has been selected with particular reference to some of the fundamentals of medical science including macromolecular processes, environmental health, genetics and genetic engineering, aging processes and theories and quantitative models which describe events in these areas. Subjects such as types of distributions, data processing and simple differential equations as they relate to biological phenomena, also form part of the course.
Prerequisite: Kin. 116* or 1st year Chemistry or consent of instructor
2 hours lectures, Fall term

303* An Introduction to Biomathematics
(Mathematics 302)
A continuation of Health Studies 302*.
Prerequisite: Health Studies 302*
2 hours lectures, Winter term

345* Community Health
A course designed to help students investigate the concept and functioning of community health.
Prerequisites: H.S. 140*, 141*, or consent of instructor
3 hours lectures, Winter and Spring terms

346* Nutrition
An elementary course in nutrition with special emphasis on diet for sport and certain physiological conditions.
Prerequisite: Kinesiology 317 or equivalent
3 hours lectures, Winter and Spring terms

348* Health Behaviour
The study of social psychological processes underlying health-related behaviours with attention to the inter-relationships of health information, attitudes and health behaviour, health behaviour measurement, perception of illness as related to medical care utilization, and interpersonal and group health behaviour.
Prerequisites: H.S. 140*, 141*
3 hours lectures, Winter and Spring terms

349* Principles of Behaviour Modification
A course providing a general overview of behaviour modification principles and procedures. Basic principles of reinforcement, punishment, modelling and desensitization are examined as they relate to the treatment of socially significant behaviours including mental health problems.
Prerequisites: Health Studies 140*, Psychology 101, or consent of instructor
3 hours lectures, Fall and Spring terms

410* Growth, Development and Aging
(Kinesiology 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.
Prerequisites: Kinesiology 200 and Biology 303
3 hours lectures, Fall and Spring terms

431* 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.
Prerequisite: Approval of supervisor

432* 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.
Prerequisite: Completion of Health Studies 431*
440* Marriage and Family
The analysis of contemporary trends in Canadian family life. Topics include mate selection, family planning, family life cycle, family dissolution, and the impact of contemporary culture and values on the modern family. 
Prerequisite: Sociology 101* or equivalent
3 hours lectures, Fall term

442* Epidemiology of Chronic Disease
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 disease causation (identification of "risk factors") and prevention.
Prerequisite: Health Studies 241* or consent of instructor
3 hours lectures, Winter term

445* 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.
Prerequisite: HS 348, 349
3 hours lectures, Winter term

472* 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.
Prerequisite: Consult with Department
Fall, Winter and Spring terms

Dance

162* Introduction to the Dance
An overview of dance as manifest through its earliest forms as an expression of folk culture to its artistic presentation in contemporary investigation of the perspectives from which dance can be studied.
2 hrs./wk. lect., 2 hrs/wk. studio laboratory
Fall term

163* A Study of the Medium of Movement
A course leading to an understanding of the broad conceptual framework of movement emphasizing the qualitative nature of movement and its relationship to creative expression.
Prerequisite: Dance 162* or consent of instructor
2 hrs./wk. lect., 2 hrs/wk. studio laboratory
Fall term

262* Dance Theory: Process
This course focuses upon selected compositional theories of major dance artists as examples of the changes in choreographic approach from the 30's to 70's.
Prerequisite: Dance 163* or consent of instructor
2 hrs./wk. lect., 4 hrs./wk. studio laboratory
Fall term

263* Dance Theory: Product (Modern Dance)
This course focuses upon theories of dance as they engender a particular view of art and a particular view of the human body and thus delimit the nature of the created work itself. The nature of a theory is discussed, as is the nature of scientific and aesthetic theories. Ultimately the student develops his own theory of dance.
Prerequisite: Dance 262*
2 hrs./wk. lect., 4 hrs./wk. studio laboratory
Winter term

264* History of the Classic Dance to 1909
Historical survey of the development of the classics from elements appearing in the Greek Theatre to the end of the Russian classic period in the early 20th century.
Prerequisite: Dance 162* or consent of instructor
2 hrs./wk. lect., 2 hrs./wk. studio, Fall term

362* Socio-cultural Study of the Dance
Dance as an avenue for socio-cultural expression is examined from the perspective of the social sciences.
Prerequisites: Soc. 101 and Dance 264* or permission of instructor
2 hrs./wk. lect., 2 hrs./wk. tutorial, Winter term
363* Dance Ethnology
A comparative study of ethnic dance forms with a particular emphasis on dance style as significant cultural pattern. The course attempts to develop an understanding of the effect of particular ideologies and political systems on the development of a cultural dance form.
Prerequisite: Dance 264* or consent of instructor
2 lectures, 2 studio, Winter term

364* Development Aspects of Movement
A study integrating the cognitive and perceptual developments in children as they relate to motor development. Primary emphasis is placed on investigating movement experiences suitable for children.
4 hours per week, 2 hours lecture, 2 hours tutorial
to be arranged
Fall term

365* Dance Criticism
This course covers questions about the role of the critic, his audience, his credentials, etc. The course also focuses upon particular dance events, in the studio and on the stage, for the purpose of developing critical faculties in a living context.
Prerequisite: Dance 263*
2 hrs./wk. lect., 2 hrs./wk. studio laboratory,
Winter term

Dance 366* 20th Century Ballet: Part 1 (History)
An in depth study of the factors affecting the Ballet in the 20th century from the advent of the Russians in Paris in 1909 to the influence of contemporary dance in recent years.
Prerequisite: Dance 264*
2 hrs./wk. lect., 2 hrs./wk. tutorial, Fall term

367* 20th Century Ballet: Part 2 (Analysis)
Analysis and study of the themes and styles of 20th century ballets and the changing attitudes to the theatre. Consideration is given to the adaptations of the classical idiom to the artistic trends of this century.
Prerequisite: Dance 366*
2 hrs./wk. lect., 2 hrs./wk. studio laboratory,
Winter term

461*/462* Research Project
An independent research project on an approved topic, supervised by a faculty member. Required of all students enrolled in Honours Dance, Dance 461* includes an approved design and the completion of the first segment of the paper.
Prerequisite: depending upon the topic selected, the student is required to achieve at least 60% in appropriate courses. A complete listing is available in the Departmental office.
Dance 462* includes the completion of the project begun in Dance 461*
Prerequisite: Dance 461*

463* Seminar in Dance
An examination of current and major issues in dance.
Prerequisite: Kinesiology (Dance) students only
3 hrs./wk., Winter term

464* Philosophy of the Dance
The concern of this course is the relationships of man to the art products which he fashion. Questions such as, are all people creative? are discussed as is the validity of a distinction between art and life. A phenomenological analysis of dance is presented, discussed, critiqued and evaluated.
Prerequisite: Phil. 100 and two full courses in the dance
Department of Man-Environment Studies

Professor, Chairman

Associate Professor, Undergraduate Officer
A.T. O'Brien, B.S.(Marymouth), Ph.D.(Fordham)

Professor

Associate Professors
E.J. Farkas, B.S.E.(Princeton), Sc.D.(M.I.T.)
D.W. Fischer, B.S.(Trinity), M.S.(Michigan State), Ph.D.(Colorado State)

Assistant Professors
G.S. Davies, B.P.E., B.Sc., M.Sc.(U.B.C.), Ph.D.(California)
S.K. Gupta, B.Sc., M.Sc.(Punjab), M.A., Ph.D.(Toronto), on Sabbatical Leave 1975-76
J. Harding, B.A., M.A.(Sask.), Ph.D.(Simon Fraser)
R.F. Keith, B.S.A.(Guelph), M.A., Ph.D.(Michigan State)
S.C. Lerner, B.A.(Ohio State), M.A.(Columbia)
A.V. Morgan, B.A.(Leicester), M.A.(Calgary), Ph.D.(Birmingham)
T.McL. Semple, B.A.(Western Ontario), M.A., Ph.D.(Waterloo)
J.B. Theberge, B.Sc.A.(Guelph), M.Sc.(Toronto), Ph.D.(British Columbia)
D.L. Wahlsten, B.A.(Alma College), Ph.D. (California, Irvine)

Lecturer
J.E. Robinson, B.Sc.(Waterloo) (part time)

Faculty members holding cross/and/or joint appointment(s) as shown
1 Planning and Man-Environment Studies
2 Man-Environment Studies and Anthropology
3 Architecture, Geography, Man-Environment Studies and Planning
4 Man-Environment Studies and Earth Sciences
5 Planning, Man-Environment Studies and Biology
6 Psychology and Man-Environment Studies

Course Descriptions
Man-Environment Studies

Undergraduate Course Descriptions

120 Environmental Issues and the Natural Sciences
Survey and analyses of selected environmental issues drawing upon concepts and theories from the natural and life sciences. Content of course closely integrated with M-Env 130 and organized into thematic units dealing with human and community studies, resource and environmental management, technology and society inter-relationships.
Prerequisite: Honours Man-Environment Studies
To be taken concurrently with M-Env 130
3 hours, Year

130 Environmental Issues and the Social Sciences
Survey and analyses of selected environmental issues drawing upon concepts and theories from the social sciences and humanities. Content of course closely integrated with M-Env 120 and organized into same thematic units.
Prerequisite: Honours Man-Environment Studies
To be taken concurrently with M-Env 120

150 Environmental Issues: Methods & Techniques
Series of concurrent six week workshops to introduce methods and techniques appropriate for investigating different environmental problems. Students to select any four from a series of workshops such as field studies, laboratory analyses, questionnaire design, survey research, small group dynamics, and participant observation of social interactions.
Prerequisite: Honours Man-Environment Studies
3 hours, Year

190 Seminar-Workshop
Faculty-supervised individual or small group investigation of selected environmental issues to help develop skills for defining and resolving problem situations. Related or different topics may be selected for the fall and winter terms.
Prerequisite: Honours Man-Environment Studies
6 hours, Year

ES 195* Introduction to Environmental Problems
See Environmental Studies course descriptions, page 299.

ES 200* Field Ecology
See Environmental Studies course descriptions, page 299.
230* Interpreting Man-Environment Interrelationships
Review and comparison of different analytical approaches and modes of reasoning appropriate for understanding man-environment interrelationships including systems reasoning, the scientific method of enquiry, models of Man, anticipation of futures, and subjective modes of knowing.
Prerequisite: Honours Man-Environment Studies
3 hours, Winter term

240* Small Groups and the Environment
This course will focus on the ways small groups of people function. The emphasis will be on analyzing and understanding how the various groups concerned with environmental issues operate and how they might be made more effective.
No prerequisite
3 hours, Fall term

241* Social Change
An analysis of major theories of social change, the sources and patterns of change and change processes, with emphasis on the environmental context.
No prerequisite
3 hours, Winter term

247* 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.
Prerequisite: Anth. 102 or permission of instructor
3 hours, Fall term

ES 252* Media Tools for Environmental Studies
See Environmental Studies course descriptions, page 299.

ES 253* Media Tools for Environmental Studies - Advanced Level
See Environmental Studies course descriptions, page 299.

260* Visual Perception and Communication
A study of man's perception of his environment, as influenced and represented by mass media. A special emphasis will be placed on visual education and the role of media in Canada in the development of children's perceptions.
No prerequisite
3 hours, Fall term
Cross-listed as Communications Course

271* 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. This course is the same as Plan 271 and Geog 271. The Department of Man-Environment Studies strongly recommends that students who have not had Year 5 mathematics take Math 85.
Prerequisite: For students in Man-Environment Studies, Planning, Architecture or General or Honours Geography only
2 hours lecture, 1 hour lab, Fall and Winter term

272* Computer Programming in Environmental Studies
The course emphasizes computer programming skills and applications in the context of environmental problems.
Prerequisite: Geog/Man-Env/Plan 271 or consent of instructor
3 hours, Winter term
Cross-listed as Plan 272 and Geog. 272

275* 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.
Prerequisite: Consent of instructor
2 hours or equivalent, Fall and Winter terms

290 Seminar-Workshop
Individual or small group investigation of selected environmental issues. Topics chosen to reflect a "futures studies" orientation.
Prerequisite: Honours Man-Environment Studies
6 hours, Year

310* Psychological Man
The psychological correlates of the differing environments in which man develops and continues in adult life. The emphasis will be on individual differences assessed by empirical techniques and objective criteria derived from the physical and cultural environment.
No prerequisite
3 hours, Fall term

320* 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.
Prerequisite: Honours Man-Environment Studies or Introductory Economics course or consent of instructor
3 hours, Winter term
Cross-listed as Economics 357
330* Psycho-Social Aspects of Environmental Design
Acquire a flexible framework for thinking about the role of technology in man-environment systems focusing on psycho social processes. Examine Bio-Psycho-Sociotechnology component interaction networks in various systems such as housing, transportation, etc. Attempt suggestive integration of existing research from many disciplines to build sensitive models of utility in concrete situations.
Prerequisite: An introductory Social Science course or consent of instructor
Fall and Winter terms

331* Environmental Issues in a Global Perspective
Environmental issues of world-wide significance examined in the broader context of population and socio-economic development, and the changing pattern of relations among have and have-not countries. Illustrative case studies drawn from experiences of the United Nations system and other sources.
Prerequisite: Honours Man-Environment Studies or consent of instructor
3 hours, Fall term
(Not offered in 1975-76)

340* Special Topics in Environmental Science
Application of the natural or life science disciplines to selected problems of environmental importance. Emphasis is placed on the scientific principles and concepts used for analyzing problems in detail.
Prerequisite: Honours Man-Environment Studies
3 hours, Fall and Winter terms

350* 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.
No prerequisite
2 hours, Winter term

351* Organization and Environmental Management
Analysis of selected governmental or other organizations performing important functions relating to environment. Their perceptions of policy issues and goals, programme planning, budgeting, and delivery processes. Role of different specialists and “generalists”, nature and extent of public participation.
No prerequisite
2 hours seminar, Winter term

356* 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 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.
No prerequisite
3 hours, Fall term
Cross-listed as Science 350

357* Conservation and Resource Management
Ecologic and economic approaches to the planning and management of renewable resources including forests, agricultural lands, fish and wildlife, water resources, oceans, parks and outdoor recreation uses. Essentially the same as Geog. 357 and Plan 357.
No prerequisite
3 hours, Fall term

ES 358* Environmental Pollution and its Control
See Environmental Studies course descriptions, page 299.

360* Man and Nature
A brief study of various cultural beliefs and attitudes towards “Nature and Environment” in different periods of history and in different societies. Such concepts as “Natural order”, Biological Rhythms, and Man’s relationship to nature will be explored.
Prerequisite: Consent of instructor
3 hours, Winter term

361* Contemporary Media of Communication and Human Environment
A study of history of media and their role in the cultural evolution of man. An exploration of the influence of mass media in literate and non-literate societies will be made, with special reference to social and political changes.
Prerequisite: M-Env 260 or the consent of instructor
4 hours, Winter term
Cross-listed as Communications Course

375* Special Readings or Seminar on Selected Topics
Prerequisite: Consent of instructor
2 hours or equivalent, Fall and Winter terms

ES 380*/381* Environmental Studies Workshop
See Environmental Studies course descriptions, page 300.
Course Descriptions
Man-Environment Studies

390 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. Prerequisite: Honours Man-Environment Studies 6, 12 hours, Year

ES 400 Environmental Law
See Environmental Studies course descriptions, page 300.

410 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. Prerequisite: Honours Man-Environment Studies or consent of instructor 3 hours, Year

431 Comparative Approaches to Environmental Management
Environmental programmes of other nation states compared to Canadian approaches. Case studies from U.S., British and European situations, and other countries. Course meets on campus during Winter term and in the field in other countries during Spring term. Spring term limited to a period of 6-8 weeks. Laboratory fee varies with field observation. Prerequisite: Honours Man-Environment Studies and consent of instructor; non-majors, consent of instructor 2 hours, Winter term: 6-8 weeks, Spring term

445 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. Prerequisite: Honours Man-Environment Studies fourth year or consent of instructor 3 hours, Year

450 Honours Seminar: Environmental Design
Major psycho-social problems related to design and use of urban, rural and wilderness environments. Integration of psycho-social information with economics and environmental information in the design process. Prerequisite: Honours Man-Environment Studies or consent of instructor 2 hours seminar, Year

470 Environmental Teaching and Learning
Examination of physical and social environments which induce particular kinds of learning. Practical training and experience in project development and coordination, leadership and group facilitation processes. Prerequisite: 3rd and 4th year Honours Man-Environment Studies and consent of instructor 3 hours, Year

475* Special Readings or Seminar on Selected Topics
Prerequisite: Consent of instructor 2 hours or equivalent, Fall and Winter terms

476 Special Readings or Seminar on Selected Topics
Prerequisite: Consent of instructor 2 hours or equivalent, Year

480 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. Prerequisite: Honours Man-Environment Studies 3 hours, Year

490 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. Prerequisite: Honours Man-Environment Studies Year 6, 12, 18 hours, Year
Undergraduate Course Descriptions

Management Sciences Option

(2 hours lecture and one hour lab per week)

**404 Organizational Behaviour**
The course presents a systematic approach to the study of human behaviour in organizations. It synthesizes different concepts and findings from the behavioural sciences and shows their applications to business. More specifically the course deals with some manpower problems, i.e., selection, training, control, and motivation problems; with interpersonal and small group behaviour, norms and values, leadership and authority, and with organizational structure and change.

**405 Managerial Economics**
The course is designed to give the student an appreciation of the usefulness of basic concepts from economics in managerial decision making. Topics considered will include costs, costs as foregone opportunities, accounting definition of cost, production as a process in time relating costs to benefits.

**406 Managerial Decision Making 1**
The nature and context of managerial decision making, elementary introduction to utility theory. Basic probability theory; review of important concepts. Strategies for decision. Criteria for decisions, including multiple objectives. Brief introduction to optimization methods. Examples from management problems.

**407 Managerial Decision Making 2**
Production/Industrial Engineering Option

3 hours lectures and 1 hour lab per week

21 Applied Probability and Statistics

23 Engineering and Managerial Economics
Application of the concepts of efficiency and costs to engineering and management decision making. Choice of inputs and processes. Evaluation of capital projects. Examples will include make or buy decisions and replacement of equipment decisions.

31 Industrial Statistics and Design of Experiments
Prerequisite: MS21 or equivalent

43 Economics of Enterprise and Benefit
Cost Analysis
Applications of models of household and enterprise behaviour to private and public decision making. Seller strategy in consumer and industrial markets. Valuation of nonmarket goods. Examples will include use of buyer behaviour data to determine market segments, use of history of competitor behaviour to determine bidding strategy, and evaluation of a public investment.
Prerequisite: MS23 or equivalent

44 Industrial Psychology

46 Stochastic Models of Industrial Operations
Definition and classification of stochastic processes. Detailed analysis of Markov processes including analytic (generating functions) and graphical methods. Recurrent events including birth and death processes, branching processes and random walks. Waiting line models and their applications. Markovian decision problems. Application areas include inventory control, reliability, equipment replacement, maintenance, design of service facilities, reservoir control, etc.
Prerequisite: MS21 or equivalent

47 Optimization Models for Policy Analysis

51 Systems Simulation
Systems as multicomponent, bounded interacting objects. Conservative and non-conservative systems. Physical and mathematical analogues and models. Model formulation and computability: Simulation as iterative approximation of non-provable convergence. Event distribution models and Monte Carlo simulation, with industrial examples. Cybernetic (or dynamic) simulation, with industrial examples.

53 Decision Theory and Organization
Group interactions and the problems of industrial macro-organizations. Discussion of organizational decision-making and control processes, with particular emphasis on the relevant theories of structural relations of organizations.
Faculty of Mathematics

Dean of the Faculty of Mathematics
W.F. Forbes, Ph.D., D.Sc.(London), D.I.C.

Associate Deans
C.F.A. Beaumont, B.A.(McMaster), M.A.(Toronto)
K.D. Fryer, B.A.(Western), Ph.D.(Toronto)

Associate Dean, Graduate Studies
D.D. Cowan, B.A.Sc.(Toronto), Ph.D.(Waterloo)

Assistant to the Dean
R.G. Dunkley, B.A.(Western)

Director of First Year Studies
P.C. Brillinger, B.A.(McMaster), M.A.(Waterloo)

Department of Applied Mathematics

Professor, Chairman of the Department
D.G. Wertheim, B.A.(McMaster), Ph.D.(Toronto)

Professors
C. Froese Fischer, M.A.(U.B.C.), Ph.D.(Cantab.)
(On leave, 1975-76)
B. Forte, Ph.D.(Pisa), Habil.D.Sc.(Rome)
F.O. Goodman, B.Sc.(London), Ph.D.(London),
D.Sc.(London), F.Inst.P.
M.A. McKiernan, M.A.(Loyola), Ph.D.(I.I.T.)

Associate Professors
C.F.A. Beaumont, B.A.(McMaster), M.A.(Toronto)
J. Cizek, R.N.Dr.(Charles University, Prague),
C.Sc.(Czechooslovak Academy of Sciences, Prague)
(On Sabbatical Leave 1974-75)
J. Froese, B.A.(Manitoba), M.A.(Queen's),
Ph.D.(U.B.C.)
W.H. Hui, B.Sc.(Peking), Ph.D.(Southampton)
G.J. Lastman, M.A.(U.B.C.), Ph.D.(Texas)
F.R. McCourt, B.Sc., Ph.D.(U.B.C.)
L.J. McGee, B.A.Sc.(Toronto), M.Sc.(Waterloo),
Ph.D.(Yale) (On Sabbatical Leave, 1974-75)
J. Paldus, R.N.Dr.(Charles University, Prague),
C.Sc.(Czechoslovak Academy of Sciences, Prague)
P.J. Pontz, M.A.(Toronto), Ph.D.(Illinois)
J. Wainwright, B.Sc(Natal), Ph.D.(South Africa)
R.A. Wentzell, B.Sc.(Acadia), Ph.D.(Western)

Assistant Professors
G.W. Horndeski, B.Sc.(Washington University),
Ph.D.(Waterloo)
S.P. Lipshitz, B.Sc.Hons.(Natal), M.Sc.(South Africa),
Ph.D.(Witwatersrand)
R.G. McLenaghan, M.Sc.(Queen's), Ph.D.(Cantab.)
M.E. Snyder, B.Sc.(Western), M.Sc.(Waterloo)

Lecturer
B.J. Marshman, Ph.D.(Waterloo)
Adjunct Professors
D.J. Henderson, B.A.(U.B.C.), Ph.D.(Utah), F.Inst.P.
D. Lovelock, Ph.D.(Natal), D.Sc.(Natal)
H. Rund, Ph.D.(Cape Town), Habilitation(Freiburg)

Research Associate
Z. Dvoracek, M.S., R.N.Dr.(Charles University, Prague), Ph.D.(Czechoslovak Academy of Sciences, Prague)

Postdoctoral Fellows
Y-S. Huang, B.S.(Tunghai University), Ph.D. (Waterloo), C.C.A. Sastri, M.Sc.(Andhra), Ph.D.(New York)

Faculty member holding cross-appointment as shown:
¹ Computer Science
² Statistics and Computer Science
³ Pure Mathematics
⁴ Chemistry

Department of Combinatorics and Optimization

Professor, Chairman of the Department
R.C. Mullin, B.A.(Western), Ph.D.(Waterloo)

Distinguished Professor
W.T. Tutte, Ph.D.(Cantab.), F.R.S.C.

Professors
G. Berman, M.A., Ph.D.(Toronto)
H.F. Davis, Ph.D.(M.I.T.)
J. Edmonds, B.A.(Geo. Washington), M.S.(Maryland)
K.D. Fryer, B.A.(Western), Ph.D.(Toronto)
P.L. Hammer, Ph.D.Math.(Bucharest)
R.C. Read, M.A.(Cantab.), Ph.D.(London)

Associate Professors
J.A. Bondy, D.Phil.(Oxon.)
C.E. Haff, B.S.(Stanford), Ph.D.(Waterloo)
R.A. Honsberger, B.A.(Toronto), M.A.(Waterloo)
H. Shank, M.Sc.(Chicago), Ph.D.(Cornell)
D.H. Younger, Ph.D.(Columbia)
M. Best, M.Math.(Waterloo), Ph.D.(U.C. Berkeley)

Assistant Professors
R.N. Burns, B.Sc.(Toronto), Ph.D.(Waterloo)
A.R. Conn, B.Sc.(Imperial College), M.Sc.(Manitoba), Ph.D.(Waterloo)
G.B. Faulkner, B.A.Sc.(Toronto), Ph.D.(Waterloo)
D.M. Jackson, Ph.D.(Cantab.)
P. Schellenberg, Ph.D.(Waterloo)

Lecturer, Assistant Chairman Administration
E. Anderson, B.A.(McMaster)

Lecturers
R.G. Dunkley, B.A.(Western)
R.G. Scoins, B.A.(Western), M.Math.(Waterloo)
P. Zima, M.Sc.(Prague)

Postdoctoral Fellows
F.R. Bernhart, M.S.(Michigan), Ph.D.(Kansas State)
C. Charalambous, B.Sc.(Surrey), Ph.D.(McMaster)
C. Huang, B.A.(Dublin), Ph.D.(McMaster)

Adjunct Professors
E.L. Johnson, B.S.(Georgia Tech.), Ph.D.(U.C. Berkeley)
C.St. J.A. Nash-Williams, Ph.D.(Cantab.), F.R.S.E.
R.G. Stanton, B.A.(Western), Ph.D.(Toronto)
RE. Woolsey, Ph.D.(Texas)
Department of Computer Science

Professor, Chairman of the Department
J.D. Lawson, B.A.Sc.(Toronto), Ph.D.(Waterloo), F.I.M.A.

Professor, Associate Chairman of the Department
W.M. Gentleman, B.Sc.(McGill), Ph.D.(Princeton)

Professors
J.A. Brzozowski, M.A.Sc.(Toronto), Ph.D.(Princeton)
P.C. Fischer, M.B.A.(Michigan), Ph.D.(M.I.T.), F.S.A.
(On leave, 1975-76)
B. Forte, Ph.D.(Pisa), D.Sc.(Rome)
C. Froese Fischer, M.A.(U.B.C.), Ph.D.(Cantab.)
(On leave, 1975-76)
J.W. Graham, M.A.(Toronto)
T. Pietrzykowski, M.A.(Warsaw), Ph.D.(Polish Acad. Sci.)

Associate Professors
E.A. Ashcroft, B.A.(Cantab.), Ph.D.(Imperial College)
D.D. Cowan, B.A.Sc.(Toronto), Ph.D.(Waterloo)
K. Culik, M.Sc., R.N.Dr.(Prague), Ph.D.
(Czechoslovak Acad. Sci.)
J.A. George, M.Sc.(Alberta), Ph.D.(Stanford)
J.G. Linders, M.A.Sc.(Toronto), Ph.D.(Imperial College)
E.G. Manning, M.Sc.(Waterloo), Ph.D.(Illinois)
R.B. Simpson, M.A.Sc.(Toronto), Ph.D.(Maryland)

Assistant Professors
R. Benesch, M.Sc.(Alberta), Ph.D.(Queen's)
P.C. Brillinger, B.A.(McMaster), M.A.(Waterloo)
K.O. Geddes, B.A.(Saskatchewan), M.Sc., Ph.D.
(Toronto)
J.F. Gentleman, M.S.(Chicago), Ph.D.(Waterloo)
I. Majithia, B.Sc.(London), M.Eng., Ph.D.(McMaster)
M. Malcolm, B.Sc., M.S.Eng.(Denver)
M.S., Ph.D.(Stanford)
D.E. Morgan, B.Sc.(Rose Polytechnic Inst.), M.S.
(Michigan), Ph.D.(Waterloo)
J.I. Munro, B.A.(New Brunswick), M.Sc.(U.B.C.),
Ph.D.(Toronto)
C.T. Ng, B.Sc.(Chinese Univ.), Ph.D.(Waterloo)
R.W. Peebles, B.Sc.(McGill), Ph.D.(Pennsylvania)
L.D. Rogers, B.Sc.(McGill), Ph.D.(Waterloo)
G. Sager, Ph.D.(Washington)
F.W. Tompa, Sc.M.(Brown), Ph.D.(Toronto)
J.H. Vellinga, B.A.(Western), M.A.(Waterloo)
(part-time)

Research Assistant Professors
E.J.H. Chung, B.Sc.(Manitoba), M.D.(U.B.C.),
M.Math.(Waterloo)
C.M. Hoffman, Vordiplom(Hamburg), M.A.(Indiana),
Ph.D.(Wisconsin)
T.S.E. Maibaum, B.Sc.(Toronto), Ph.D.(London)
R.T. Moench, B.Sc.(Sussex), M.Sc., Ph.D.(Toronto)
J.W. Welch, B.Sc.(McGill), Ph.D.(Waterloo)

Lecturers
R.J. Beach, M.Math(Waterloo)
V.A. Dyck, M.Math(Waterloo)
M.I. Irland, M.Sc.(Illinois), M.Phil.(Waterloo)
J.A. Smith, M.Sc.(Waterloo)

Postdoctoral Fellow
P.H. Morris, M.Sc.(Nat. Univ.Ireland), Ph.D.
(U.C. Irvine)

Adjunct Professors
P.H. Dirksen, M.A.(Waterloo)
E.L. Robertson, B.Sc.(California Inst. Tech.), Ph.D.
(Wisconsin)

Faculty Members holding cross-appointments as shown

1 Applied Mathematics and Statistics and Computer Science
2 Applied Mathematics and Computer Science
3 Computer Science and Statistics
4 Statistics and Computer Science
5 Electrical Engineering and Computer Science
6 Director, Computing Centre
Course Descriptions
Mathematics

Department of Pure Mathematics

Associate Professor, Chairman of the Department
A. Kerr-Lawson, B.A.(Toronto), M.A.(Chicago)
Ph.D.(McMaster)

Distinguished Professor
J. Aczel, Ph.D.(Budapest), Habil.D.Sc.(Hungarian
Acad. Sci.), F.R.S.C.

Professors
G.E. Cross, M.A.(Dalhousie), Ph.D.(U.B.C.)
D.Z. Djokovic, Ph.D.(Belgrad)
H. Haruki, Ph.D.(Osaka)
P.N. Hoffman, B.A.(Toronto), Ph.D.(Manchester)
M.A. McKiernan, M.A.(Loyola), Ph.D.(I.I.T.)
R.A. Staal, Ph.D.(Toronto)
D.B. Sumner, M.Sc.(Cantab.), D.Phil.(Witwatersrand)
J.W. Tucker, B.Sc.(London), Ph.D.(London)

Associate Professors
J.G. Anderson, M.Sc.(Durham), Ph.D.(Newcastle)
J.A. Baker, M.A.(Saskatchewan), Ph.D.(Waterloo)
S.N. Burris, Ph.D.(Oklahoma)
Y. Chen, M.Ph.(Frankfurt), Ph.D.(Bochum)
G. Dankert, Dip.Math.(T.U. Hanover), Ph.D.
(Cologne)
W.J. Gilbert, M.A.(Cantab.), D.Phil.(Oxon.)
D.A. Higgs, B.Sc.Hons. (Witwatersrand), M.A.
(Cantab.), Ph.D.(McMaster)
P.L. Kannappan, B.Sc.(Annamalia), Ph.D.
(Washington)
D. Mowat, Ph.D.(Waterloo)
F.C.Y. Tang, B.Sc.(Hong Kong), M.S.(South
Carolina), Ph.D.(Illinois)

Associate Professor of Foundations of Mathematics
Ph.D.(Brussels)

Assistant Professors
L.J. Cummings, Ph.D.(U.B.C.)
L.J. Dickey, M.A.(Arizona), Ph.D.(Wisconsin)
J. Malzan, Ph.D.(Toronto)
E.M. Moskal, B.A.(Toronto), Ph.D.(Illinois)
K.A. Rowe, B.S.(Toronto), M.S.(Wisconsin),
Ph.D.(Illinois)

Faculty Members holding cross appointments as
shown
1 Pure Mathematics and Applied Mathematics
2 Pure Mathematics and Philosophy
3 St. Jerome's and Pure Mathematics

Department of Statistics

Professor, Chairman of the Department
J.G. Kalbfleisch, Ph.D.(Waterloo)

Professors
G.A. Barnard, M.A., D.Sc.(Cambridge)
W.F. Forbes, Ph.D., D.Sc.(London), D.I.C.
B. Forte, Ph.D.(Pisa), Habil.D.Sc.(Rome)
V.P. Godambe, M.Sc.(Bombay), Ph.D.(London)
P.M. Reilly, B.A.Sc.(Toronto), D.I.C., Ph.D.
(London), F.S.S.
D.A. Sprott, Ph.D.(Toronto)
M.D. Vogel-Sprott, B.A.(McMaster), Ph.D.(Toronto)

Associate Professors
G.W. Bennett, Ph.D.(Adelaide)
M.A. Bennett, B.A.(Nottingham), F.S.A., F.C.I.A.
W.H. Cherry, Ph.D.(Melbourne)
W.M. Gentleman, B.Sc.(McGill), Ph.D.(Princeton)
I.D. Kalbfleisch, Ph.D.(Waterloo)
J.F. Lawless, Ph.D.(Waterloo)
W.S. Rickert, Ph.D.(Waterloo)
M.E. Thompson, B.Sc.(Toronto), Ph.D.(Illinois)
R.V. Thysell, B.Sc.(Montana), Ph.D.(Iowa)
J.C. Young, B.A.Sc.(Toronto), M.Sc.(Waterloo), Ph.D.
(Edinburgh)

Assistant Professors
K.S. Brown, Ph.D.(Waterloo)
B.L. Eyford, B.Sc.(U.B.C.), Ph.D.(Southampton)
J.F. Gentleman, M.S.(Chicago), Ph.D.(Waterloo)
J.C. Robinson, M.A.Sc., P.Eng., Ph.D.(Waterloo)
J.B. Whitney, M.A.(Western), Ph.D.(Toronto)

Research Assistant Professor
P.A. McBride-Warren, B.A.(Dallas), Ph.D.(Kansas
State)

Lecturers
R.L. Brown, B.Math.(Waterloo), A.S.A.
F. Reynolds, M.Sc.(Manitoba), F.S.A., F.C.I.A.
C. Springer, M.Sc.(McGill)

Instructors
S. Esterby, M.Math.(Waterloo)
I. McLeod, M.Math.(Waterloo)
Postdoctoral Fellows
J.A. Chapman, Ph.D.(Waterloo)
(Cambridge)
R.R. Knispel, M.Sc.(Toledo), Ph.D.(Montana State)
C.Y. Lee, M.Sc., Ph.D.(Simon Fraser)
I. Rabinovitch, B.Sc.(McGill), Ph.D.(Dartmouth)

Adjunct Professors
I.P. Fellegi, Ph.D.(Carleton)
A. Finch, Ph.D., D.Sc.(London), D.I.C.
R.C. Frecker, B.Sc.(Memorial), M.D.(Dalhousie)
M. Zelen, B.Sc.(City College, New York), M.A.
(North Carolina), Ph.D.(American)

Faculty Members holding cross-appointments
as shown
1 Applied Mathematics and Statistics and Computer
Science
2 Chemical Engineering and Statistics
* Statistics and Psychology
4 Psychology and Statistics
5 Computer Science and Statistics
* Statistics and Computer Science

Strategy Board Members

University of Waterloo Faculty of Mathematics
R.S. Aberg
General Manager
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Shell Canada Limited
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Central Region
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Manager
Information Systems
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Information Systems
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Management Information Services
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R.P. Wismer
Manager
Systems Development
Noranda Mines Limited
D.T. Wright
Deputy Provincial Secretary
Secretariat for Social Development
Province of Ontario

The University of Waterloo Strategy Board was
established to provide liaison between the Faculty of
Mathematics and knowledgeable representatives from
key sectors of the economy. Board meetings are
normally held twice a year.
Electives for Mathematics Students

The following courses may be counted as non-mathematics electives by mathematics students.

Math 206 may be taken only by students in the Co-operative Mathematics Teaching Option.

Math 100 Commercial Law for Mathematics Students


Math 101a Applications of Mathematics

Math 101, 201, 301 and 401 is a sequence of courses designed to illustrate the representation of a real situation by a mathematical model. The mathematical techniques necessary to formulate the model and to discuss its behaviour are developed as required. Examples will be taken from diverse fields since one of the aims of the course is to formulate models to describe unfamiliar situation.

a) First term: Models using difference equations will be formulated for examples drawn from biology, ecology, economics and psychology.

3 hours lectures, 1 hour tutorial. Fall term

Math 101b Applications of Mathematics

See preamble to Mathematics 101a.

b) Sets of difference equations, probability and matrix theory will be used to describe models from biology, ecology, economics, psychology and physiology.

3 hours lectures, 1 hour tutorial. Winter term

Math 201a Applications of Mathematics

See Math 101a.

Ordinary differential equations will be applied to models drawn from biology, economics, physiology and physics.

2 hours lectures, 1 hour tutorial

Prerequisite: M101, 120, 230 or consent of instructor

Math 201b Applications of Mathematics

See Math 201a.

Other examples from biology, ecology, economics, physiology and physics will be discussed using sets of differential equations.

2 hours lectures, 1 hour tutorial

Prerequisite: M201a

Math 206a Introduction to Mathematics Education

Current trends in education, professional practices and administration, the role of the department head, lesson planning, techniques of teaching, evaluation of students, special students, extra-curricular activities, the relationship between elementary and secondary school mathematics, audio-visual materials, current textbooks.

Note

Math 206a is offered only to students in the Co-op Teaching Option

Math 301a Applications of Mathematics

See Math 101a.

Partial differential equations are applied to diffusion processes, blood flow and wave phenomena.

2 hours lectures, 1 hour tutorial

Prerequisite: M217 or equivalent, or consent of instructor

Math 301b Applications of Mathematics

See Math 301a.

Laplace transforms are applied to problems in ecology, physiology and other fields.

2 hours lectures, 1 hour tutorial

Prerequisite: M217 or equivalent, or consent of instructor

Math 302 Applications of Mathematics to the Biological Sciences

The course material has been selected with particular reference to some of the fundamentals of Medical Science including Macromolecular processes, Environmental Health, Genetics and aging processes and quantitative models which describe events in these areas.

2 hours lectures, 1 hour tutorial

Note

302 may not be counted as Mathematics credit but may be counted as an elective credit.

Math 304a Foundations of Mathematics

An introduction to the problems of the foundations of mathematics. This course will normally be taken in third or fourth year. It will be an elective credit for mathematics students.

3 hours lectures

Prerequisite: Consent of instructor

Math 304b 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. It will be an elective credit for mathematics students.

3 hours lectures

Prerequisite: Consent of instructor
Mathematics

Mthel 401a Applications of Mathematics
See Mthel 101a.
Integral equations and integral transforms will be applied to systems with memory.
2 hours lectures. Fall term
Prerequisite: Consent of instructor

Mthel 401b Applications of Mathematics
See Mathematics 401a.
Students will construct a model and interpret it as a project.
2 hours lectures. Winter term
Prerequisite: Consent of instructor

Mthel 402 Topics in Mathematical Aspects of Chemistry, Biology, and the Medical Sciences
Subjects will be selected from areas such as epidemiology and mathematical models of disease processes including heart disease, cancer and aging. Consideration will be given to the quantitative evaluation of the role of environmental factors important in human disease processes.
2 hours lectures
Prerequisite: M302 or consent of the instructor

Undergraduate Course Descriptions

Note
The number of hours or lectures shown after the course description is an attempt to indicate the "normal"; each instructor determines how often his particular class will meet.

12 Calculus 1
Differential and integral calculus of functions of one real variable. Transcendental functions. Integration techniques. Applications to rate, max./min., area, volume, moment, fluid pressure and work problems. Parametric and polar equations. Series of constants; power series; Taylor and Maclaurin series.
3 hours lectures, 3 hour tutorials, 2 hours labs

21 Algebra and Vector Geometry
3 hours lectures, 1 hour problems

22 Calculus 2 (For Chemical Engineers)
Partial differentiation, the gradient, multiple integrals with applications, line and surface integrals, divergence and curl, theorems of Green and Stokes. Applications to physical problems.
3 hours lectures, one term

25 Calculus 2 (For Electrical Engineers)
Differential calculus of functions of several variables. Differential equation. Multiple integrals.
Prerequisite: M12 or equivalent

31 Differential Equations
3 hours lectures

32 Numerical Analysis
A survey of numerical procedures with emphasis upon computer implementation using the FORTRAN 1V 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.
2 hours lectures, 2 hours problems, one term
Offered in the Fall and Spring terms
Prerequisite: An introductory programming course
35 Advanced Calculus (for Electrical Engineers)
2 lectures, 1 hour problems, one term

44 Complex Variable
Cauchy-Reimann equations, the Cauchy integral theorems, conformal mapping, the Taylor and Laurent series, contour integration.
2 lectures, 1 hour problems, one term

51 Probability and Statistics
Frequency distributions; probability; Binomial, Normal, Poisson laws. Sampling theory. Distribution of Chi-squared, F, and t. Hypothesis testing, quality control, regression theory. Curve fitting. Analysis of variance, introduction to experimental design.
3 lectures, 2 hours problems, one term

52 Applied Probability and Statistics
(for Mechanical Engineers)
3 hours lectures, 1 hour tutorial, one term

Note
This course is cross listed in Management Sciences as MS21.

73a Introduction to Solving Business Problems by Computer
An introduction to algorithms with emphasis on the solution of mathematical problems arising in the business world. Concept and properties of an algorithm, language and notation for describing algorithms. Analysis of problems, development of models and algorithms for their solution; implementation in procedure oriented languages (FORTRAN IV and BASIC) and the execution of these programs using several computing facilities.
2 hours lectures, 2 hours tutorial, one term
Offered in the Fall and Winter terms

Note
Math 73a is a prerequisite for Math 73b, 73c and 73d

Note
Only one of Math 73a, 112a and 122a can be taken for credit.

Note
Math 73a cannot be counted for credit towards a B.Math degree.

73b Modelling & Simulation for Business Applications
This course is intended to introduce students to the techniques of modelling, simulation and analysis of business systems. Simulation is developed as an effective tool for studying various types of business system environments. Students will be required to develop and run simulation models using both GPSS and dynamo programming languages.
3 hours lectures, Winter term
Prerequisite: Math 73a or the equivalent. An introductory statistics course

Note
Math 73b cannot be counted for credit toward a B.Math degree.

73c The Computing Process
This course is designed for the student who will encounter computing facilities in his or her career and must have an understanding of the terminology, hardware (computing machinery), software (computer programs), and financial and management aspects of the computing process. Topics include: historical development of computing machinery and programming languages; methods of job processing; development/maintenance of application programs; organization and management of a computer installation; uses of specialized applications packages.
2 hours lectures, Winter term
Prerequisite: Math 73a or the equivalent

Note
Math 73c was formerly called Math 72b.

Note
Only one of Math 73c, 112b can be taken for credit.

Note
Math 73c cannot be counted for credit towards a B.Math degree.
73d Introduction to File Processing
File processing is an integral part of most commercial applications. This course will give a thorough introduction to the most common 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.
2 hours lectures, 2 hours tutorial (laboratory), Fall term
Prerequisite: Math 73a or the equivalent
Note
Math 73d was formerly called Math 72a.

81 Introduction to Functions, Analytic Geometry, and Calculus
2 hours lectures

82 Introduction to Algebra
Properties of real numbers including inequalities and absolute value. Systems of equations in two and three variables including linear, quadratic, and cubic equations. Complex numbers and polar representation. Exponents, Permutations and combinations. The Binomial Theorem, Sequences and series.
2 hours lectures

83 Introductory Mathematics for Sociology Students
Set Theory, Permutations and Combinations, Vectors and Matrices, Probability Theory, Solution of Linear Equations, Game Theory, Linear Programming.
2 hours lectures, 2 hours problems lab (alternate weeks)
2 term

84 Algebra
A special course designed for students in Psychology and related subjects. Polynomial, rational, exponential and trigonometric functions, Elementary analytic geometry, Polar coordinates, Fundamental concepts in the Calculus, Linear and quadratic systems of equations, Vectors, complex numbers, Mathematical Induction, Permutations and combinations, the Binomial theorem.
2 hours lectures, 2 hours problems lab (alternate weeks)

85 Mathematics for Environmental Studies
Quantitative analysis in environmental research. Elementary concepts in Algebra, notation, terminology, operations. Introductory matrix algebra, Probability Theory, Permutations and Combinations, approaches to probability, dependent and independent events, conditional probability, Markov processes, distribution functions, including the Binomial, Poisson and Normal distributions, with applications to problems in Environmental Studies.
3 hours lectures, one term

100 Fundamental Concepts of Modern Mathematics
A course for non-mathematicians to provide some insight into the many aspects of modern mathematics. The "human interest" point of view will be stressed in order to reveal mathematics as an endeavour holding a strong place in man's culture. Emphasis will be on twentieth century ideas. To integrate the traditional with the modern, material will be organized in a conceptual rather than a chronological manner.

112a Introduction to Computers
The purpose of Mathematics 112 is to provide students in programs of study which do not emphasize Mathematics with an appreciation of the capabilities and limitations of machine computing, together with 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.
2 hours lectures, 1 hour tutorial, Fall term
Note
Credit will only be granted for one of Math 73a, Math 112a or Math 122a. Math 112a cannot be counted as a credit towards a B.Math General or Honours degree.
112b Applications and Implications of Computers
A continuation of the concepts introduced in Mathematics 112a—the applications of computers to several fields and the impact (past, present and future) of computing on society.
2 hours lectures, 1 hour tutorial, Winter term
Prerequisite: Math 112a

Note
Credit will only be granted for one of Math 112b or Math 132b. Math 112b cannot be counted as a credit towards a B.Math General or Honours degree.

119a Algebra and Geometry
Elementary number theory, mathematical induction, binomial theorem, monotone sequences, inequalities, complex numbers, elementary functions of a complex variable, polynomials and polynomial equations.
3 hours lectures, 1 hour tutorial

119b Algebra and Geometry
Determinants and matrices, vectors in two and three space, quadric surfaces, systems of equations, elementary linear transformations.
3 hours lectures, 1 hour tutorial

Note
Maths 119a and 119b are not courses for Honours Mathematics students.

120a Calculus
Functions and limits, differentiation of algebraic and trigonometric functions, applications of the derivative, the differential, Riemann sums, the first and second fundamental theorems of the integral calculus.
3 hours lectures, 1 hour tutorial

120b Calculus
Differentiation and integration of exponential and logarithmic functions, techniques of integration, applications of integration, indeterminate forms, sequences, convergence of series, power series.
3 hours lectures, 1 hour tutorial

Note
Maths 120a and 120b are not courses for Honours Mathematics students.

122a Introduction to Mathematical 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.
2 hours lectures, 2 hours tutorial, one term
Offered in the Fall, Winter and Spring terms
Prerequisite: Grade 13 mathematics is recommended

Note
Only one of Math 131a, 112b and 122a can be taken for credit.

Note
Both Math 122a and 132a may be taken for credit.

129 Algebra and Geometry
Functions and permutations. Elementary number theory. Real and complex number systems. Polynomial functions. Linear geometry and algebra in 2 and 3 space. Algebraic systems.
3 hours lectures, 1 hour tutorial

130 Calculus
Functions and limits, the derivative, differentiation of algebraic and other functions, applications of the derivative.
The integral, theorems on the integral, applications of the integral.
Sequences, convergence of series, power series.
Some elementary differential equations.
3 hours lectures, 1 hour tutorial

131a Algebra and Solid Geometry
The real and complex number system, Mathematical Induction, the Binomial Theorem, Monotone sequences and the Cauchy criterion, polynomial functions, Theory of equations.
3 hours lectures

Note
For Science students only.

131b Algebra and Solid Geometry
Determinants Vector and Matrix notation, Elementary Solid Geometry, Linear transformations, Eigenvalues and Eigenvectors.
3 hours lectures

Note
For Science students only.
132a Introduction to Computer Science – Programming and File Processing
A thorough introduction to the use of computers. Concept and properties of an algorithm, language and notation for describing algorithms. Analysis of problems dealing with files, and development of algorithms for their solution. Introduction to a procedure-oriented language (usually COBOL). The preparation, implementation and debugging of programs in such a language. Topics will normally include: file processing, file maintenance, sorting, report generation and file design.
2 hours lectures, 2 hours tutorial (laboratory), one term
Normally offered in the Fall and Winter terms
Prerequisite: Grade 13 mathematics

Note
Credit will only be granted for one of Math 73d or Math 132a.

Note
Both Math 122a and 132a may be taken for credit.

132b Introduction to Computer Science – Characteristics of Computers
A general introduction to machine and assembly-language programming and basic machine architecture. The representation of data in a computer. Address modification, indexing and indirection. Character manipulation, floating point operations and subroutine linkage. Characteristics of peripheral devices. A brief survey of software which assists user programs: compilers, loaders, input-output routines, operating systems.
2 hours lectures, 2 hours tutorial (laboratory), one term
Normally offered in the Fall and Winter terms
Prerequisite: Math 112a or 122a or 132a

Note
Credit will only be granted for one of Math 122b or Math 132b.

217 Advanced Calculus
Differential calculus of functions of several variables, multiple integrals and applications. Line integrals, Green's theorem, infinite series, uniform convergence, first and second order ordinary differential equations.
3 hours lectures, 1 hour tutorial

Note
M217 is not a course for Honours Mathematics students.

219 Linear Algebra
3 hours lectures

Note
M219 is not a course for Honours Mathematics students.

223a Introduction to Statistical Methods – 1
Descriptive statistics, graphical methods, model fitting; correlation, regression and the method of least squares. Probability theory; discrete and continuous random variables.
3 hours lectures, 2 hours tutorial, one term
Prerequisites: M120 or M130; one of M112a, M122a, M132a

223b Introduction to Statistical Methods – 2
Tests of significance, maximum likelihood estimation and large sample theory; estimation and testing in the normal distribution.
3 hours lectures, 2 hours tutorial, one term
Prerequisite: M223a

Note
M223 is not a course for Honours Mathematics students. Credit will be given for only one of M223, M233 and M243.

228 Introduction to Pure Mathematics
Examples and results in modern geometry, number theory, and algebra and analysis; the historical sources of modern mathematics.
2 hours lectures

229 Linear Algebra
3 hours lectures

233 Probability and Statistics
An introduction to probability theory and statistics, and their applications. The laws of probability, discrete and continuous random variables, expectation, central limit theorem; estimation, tests of significance, contingency tables, normal distribution theory, simple linear regression.
3 hours lectures, 2 hours tutorial, two terms
Prerequisite: M120 or M130

Note
Credit will be given for only one of M223, 233, 243.
234 Introduction to Applied Mathematics

234a 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. 
Prerequisite: Math 130

234b Mathematical Modelling
Further mathematical models from various disciplines. An introduction to Newtonian mechanics will also be included in the course. 
Prerequisite: M234a or consent of instructor

235a Actuarial Mathematics
Mathematics of Investment
The theory of rates of interest and discount, annuities and sinking funds; application to financial problems, including the determination of mortgage payments and the price and yield of bonds. 
2 hours lectures, 1 hour problems, one term

235b Basic Life Insurance Mathematics
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. 
2 hours lectures, 1 hour problems, one term

236 Elementary Differential Equations
2 hours lecture

Note
M236 is not a course for Honours Mathematics students.

237 Advanced Calculus
3 hours lectures, 2 hour tutorial 
Prerequisite: First year algebra (M119/129)

239 Introduction to Combinatorics and Optimization

239a An Introduction to Combinatorics
Recommended for students wishing an introduction to discrete mathematics, and for students intending to pursue a course of study in combinatorics and optimization. 
2 hours lectures, 2 hours tutorial 
Prerequisite: First year algebra (M119/129).

239b An Introduction to Optimization
Recommended for students wishing an introduction to optimization, and for students intending to pursue a course of study in combinatorics or optimization. 
2 hours lectures, 2 hours tutorial, one term 
Prerequisites: First year algebra (M129); Note that 239a is not a prerequisite but is highly recommended

240a Numerical Applications in Computer Science
An introduction to Numerical Procedures with emphasis upon computer implementation using the FORTRAN IV programming language. In particular, the following topics are introduced: concept of numerical errors, interpolation, curve fitting, solution of non-linear equations, numerical integration, matrix operations and solution of systems of linear equations, numerical solution of ordinary differential equations. 
Offered in the Fall, Winter and Spring terms 
Prerequisites: M122a or equivalent, and M120 or M130 and M119 or M129 
There is a special section for non-mathematics students

240b Principles of Programming Languages and Data Structures
This course is intended to cover a number of basic principles of programming languages and data structures. The emphasis will be on basic principles with motivation for programming languages arising from practical examples. ALGOL and SNOBOL will normally be the languages used. 
2 hours lectures, 2 hours tutorial 
Offered in the Fall, Winter and Spring terms 
Prerequisite: Math 122a or Math 132a or the equivalent. Math 132b is recommended
Course Descriptions
Mathematics

243 Statistics for the Sciences
The topics of Mathematics 233 with particular emphasis on the analysis and interpretation of experimental data and the design of experiments in the Sciences. The more difficult mathematical techniques associated with these problems will be omitted and many examples from Physics, Chemistry, Biology and other natural Sciences will be considered.
2 hours lectures, 1 hour laboratory

Note
Credit will be given for only one of M223, 233, 243

300a Mathematical Discovery and Invention
A study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.
2 hours lectures, one term

300b Mathematical Discovery and Invention
A study of about 100 challenging problems taken from many areas of elementary mathematics - number theory, combinatorics, geometry, probability, logic.
2 hours lectures, one term
Prerequisite: No formal prerequisites are demanded

Note
300a is not a prerequisite to 300b

307 Combinatorial Geometry
A study of combinatorial properties of plane figures, covering problems, addition of figures, maxima and minima problems, curves of constant breadth and delta-curves.
This course is designed for the student who particularly likes geometry and for the serious student of combinatorics. Occasionally brief contact is made with the subject of analysis. Thus a concurrent course in real variables would be helpful, but not essential.
2 hours lectures
Prerequisite: First year calculus (M120/130)

312a Elements of Real Variable Theory
Elementary properties of the real numbers: completeness and its relation to limits, continuity, differentiability; mean value theorems; Riemann integration, integrability of continuous and monotone functions; uniform convergence and uniform continuity.
3 hours lectures

Note
Emphasis will be on applications rather than theory.
M312a is not a course for Honours Mathematics students.

312b 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.
3 hours lectures

Note
Emphasis will be on applications rather than theory. M312b is not a course for Honours Mathematics students.

314a 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.
2 hours lectures, 2 hours tutorial, one term
Prerequisites: Knowledge of a high level language, 217 or 237, or equivalent preferably FORTRAN; Math 219 or 229 and Math

Note
Math 314a and 334a cannot both be taken for credit.

314b 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 Math 314a, the intent is to expose students to modern computational techniques for solving mathematical problems.
2 hours lectures, 2 hours tutorial, one term
Prerequisites: Knowledge of a high level language, preferably FORTRAN; Math 219 or 229 and Math 217 or 237, or equivalent

Note
Math 314b, Math 334b cannot both be taken for credit.

319 Abstract Algebra
Introduction to rings, fields, groups. Applications.

Note
Emphasis will be on examples rather than on proofs of theorems.
M319 is not a course for Honours Mathematics students.
320a Computer Applications in Business
A discussion of the algorithms for the storage and retrieval of information using storage media such as disks and tapes. The techniques developed are applied to a number of general business application areas such as billing, inventory control and general ledger accounting. Good system design and programming practices will be stressed throughout the course.
2 hours lectures, 2 hours tutorial, one term
Prerequisite: Math 132a

Note
Math 320a and 340a cannot both be taken for credit.

320b Computer Applications in Business
A continuation of the topics presented in Mathematics 320a.
2 hours lectures, 2 hours tutorial, one term
Prerequisite: Math 320a

Note
Math 320b and 340b cannot both be taken for credit.

329 Abstract Algebra
Introduction to rings, integral domains, fields, groups. Further topics and applications.

330a Projective Geometry
Projective spaces over fields, collineations and correlations, quadric curves and surfaces. References to non-euclidean geometries.
3 hours lectures, one term
Prerequisite: M229

330b Geometry of the Complex Numbers
The plane of complex numbers. The group of circle preserving mappings and its subgroups. Connections with non-euclidean geometries. Other number systems and their geometries (Laguerre, Minkowski).
3 hours lectures, one term
Prerequisite: M229

330c Euclidean Geometry
Concurrent lines, collinear points, the Euler line, the Simson line, the nine point circle. Cross ratio, projection, Harmonic range, the quadrilateral and the quadrangle. Properties of circles.
3 hours lectures, one term
Prerequisite: M229

332a Real Variables
3 hours lectures
Prerequisite: M237

332b 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.
3 hours lectures
Prerequisite: M327

334a Numerical Algebra
3 hours lectures, 2 hours tutorial, one term
Offered in the Spring and Fall terms
Prerequisite: Math 122a, Math 219 or 229 and Math 217 or 237

334b Numerical Approximation
3 hours lectures, 2 hours tutorial, Winter term
Prerequisite: Math 122a, Math 219 or 229 and Math 217 or 237

335a Finite Differences
A course in the calculus of finite difference, to include: summation, numerical integration and differentiation, relation between integration and summation; and error theory.
2 hours lectures, 1 hour problems, one term

335b Graduation of Tables
Applications of finite differences to actuarial problems in graduation of statistical tables.
2 hours lectures, 1 hour problems, one term
Prerequisites: M235a/b

336a Life Contingencies
An advanced course on problems with single lives, including population theory.
3 hours lectures, one term
Prerequisite: M235b
336b Life Contingencies
An advanced course on problems with multiple lives; multiple decrement theory; accidental death and disability benefits.
3 hours lectures, one term
Prerequisite: M235b

338a Mathematical Statistics
Continuous random variables; moments and moment generating function; distribution of t, chi-squared, and F, and their applications. Large sample theory.
3 hours lectures, one term
Prerequisites: M233, 237

338b Mathematical Statistics
The multivariate normal distribution, its properties and uses; quadratic forms and Cochran's theorem; multiple regression; introduction to the analysis of variance.
3 hours lectures, one term
Prerequisites: M229, 338a

Note
M338b and 349a cannot both be taken for credit.

339a Probability and Stochastic Processes - 1
3 hours lectures, one term
Prerequisite: One of M223, 233 or 243

339b Probability and Stochastic Processes - 2
3 hours lectures, one term
Prerequisite: M339a or consent of instructor

340a: Machine, Data and Program Structures
3 hours lectures, one term
Offered in the Fall, Winter and Spring terms
Prerequisite: Math 240b

340b: Implementation Schemes for Programming Structures
3 hours lectures, one term
Offered in the Fall and Winter terms
Prerequisite: Math 340a

341 Algebra
Theory of groups, rings, fields and other algebraic structures.
3 hours lectures
Corequisite: M229

342 Real Analysis 1
Theory of functions of real variables. The notions of compactness, connectedness, and uniformity are used in a study of continuity, differentiation, and integration.
2 hours lectures
Prerequisite: M237

343 Complex Analysis 1
Analysis of complex numbers; fundamental theorems of holomorphic functions; meromorphic functions.
2 hours lectures
Prerequisite: M237

344a Topology
Intuitive set theory, metric spaces, point set topology.
3 hours lectures, one term
Prerequisite: Consent of instructor

349a Applied Statistical Analysis
Review of Normal, t, Chi-squared and F distributions and their applications. Introduction to the design of experiments and surveys. Analysis of variance, multiple regression.
3 hours lectures, one term
Prerequisite: One of M223, 233 or M243

Note
M349a and 338b cannot both be taken for credit

349b Statistical Decision Theory
The decision problem; utilities and subjective probabilities; decision rules; decision trees, normal and extensive analyses; conjugate prior distributions and associated distribution theory; applications to business decisions. Loss functions, risk functions; admissibility, minimax rules, tests of hypothesis. An introduction to statistical quality control and control charts.
3 hours lectures, one term
Prerequisites: M223, 233 or 243; M217 or 237

Note
M349a/b may be taken in either order
351a Introduction to Graph Theory and Combinatorics
A study of the basic concepts and problems of graph theory: connection, minimum path problems; bipartite graphs, the marriage problem; 1-factors of arbitrary graphs; planar graphs.
2 hours lectures, one term
Prerequisites: No formal prerequisites. M239 recommended

351b Introduction to Graph Theory and Combinatorics
Hamiltonian circuits in a graph, four colour problem, other colouring problems; directed graphs, balanced orientations; an introduction to the theory of enumeration, with applications to counting graphs and other combinatorial objects.
2 hours lectures, one term
Prerequisites: No formal prerequisites. M239 and M351a recommended

352a Fundamentals of Optimization
Introductory study of optimization techniques common to a wide variety of operations research and engineering problems, and of fundamental theoretical interest. Linear programming, simplex method, duality; integer programming, branch and bound, transportation problems, games.
2 hours lectures, one term
Prerequisites: M219, 229 and 217, 237

352b Fundamentals of Optimization
Introductory study of optimization techniques complementary to those studied in 352a. Extrema of functions of n-variables, Lagrange multipliers, network programming. Applications to PERT, CPM, replacement policies, knapsack problems, inventory theory, capital budgeting.
2 hours lectures, one term
Prerequisites: Same as M352a

353a Modelling and Optimization
An applications oriented course that illustrates how various mathematical models and methods of optimization can be used to solve problems arising in business, industry and science.
2 hours lectures, one term

360a Tensor Analysis
Elementary introduction to classical differential geometry and tensor analysis. Curves and surfaces in Euclidean spaces, coordinate transformation, invariance of length, introduction of tensors and metric, Riemannian spaces, covariant differentiation, geodesics, curvature and Einstein tensors.
2 hours lectures + 1 hour tutorial. Fall term
Prerequisites: M237, consent of instructor

360b Differential Geometry
2 hours lectures + 1 hour tutorial. Winter term
Prerequisites: M237, 360a or consent of instructor

361a Calculus of Variations
2 hours lectures + 1 hour tutorial. Fall term
Prerequisite: M237 or consent of instructor

361b Mechanics
2 hours lectures + 1 hour tutorial. Winter term
Prerequisites: M237, 361a or consent of instructor

362a Introduction to Continuum Mechanics
2 hours lectures, 1 hour tutorial. Winter term
Prerequisites: M234, 237 or consent of instructor

362b Partial Differential Equations of Applied Mathematics
Derivation of the equations of heat flow, the vibrating membrane and the electro-magnetic field equations by various elementary techniques and illustrations of the use of calculus of variations in the derivation of equations; solutions of the above equations by separation of variables; Fourier analysis and Fourier integral.
2 hours lectures, 1 hour tutorial. Fall term
Prerequisites: M234, 237 or consent of instructor
363 Differential Equations
2 hours lectures + 1 hour tutorial
Prerequisites: M234, 237 or equivalent, 332 (Real Variables) may be taken concurrently.

371a Digital Networks
3 hours lectures, one term
Offered in the Fall, Winter and Spring terms
Prerequisite: M132b

372b Introduction to the Theory of Computing
Models of computers including finite automata and Turing machines. Basics of formal languages. Relations between machine models and formal languages with applications to syntax of programming languages. Unsolvable problems and their relevance to the semantics of programming. Concepts of computational complexity including algorithm optimality.
3 hours lectures, one term
Offered in the Fall, Winter and Spring terms
Prerequisite: Math 240b

380a Introduction to Information Theory with Applications
2 hours lectures, 1 hour tutorial

380b Introduction to Information Theory with Applications
Measures of expected conditional information. Maximizing expected conditional information. Applications to communication theory and programming. Basics in questionnaire theory.
2 hours lectures, 1 hour tutorial
Prerequisite: M380a

398 Undergraduate Seminar
2 hours lectures

399 Reading in Mathematics
417a Optimizational Combinatorics
Recommended for students interested in theoretically advanced study in Combinatorics and Optimization or Computer Science.
2 hours lectures, one term
Prerequisite: M352a or consent of instructor

417b Optimizational Combinatorics
Recommended for students interested in theoretically advanced study in Combinatorics and Optimization or Computer Science.
2 hours lectures, one term
Prerequisite: M417a or consent of instructor

418a Combinatorial Applications of Computers
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: Pólya's theorem and variations. Applications.
Useful for students wishing to specialize in the more computationally-oriented aspects of graph theory or operations research.
2 hours lectures, one term
Prerequisites: Practical knowledge of at least one computer programming language. Algebra (M319/329)

418b Combinatorial Applications of Computers
Useful for students wishing to specialize in the more computationally-oriented aspects of graph theory or operations research.
2 hours lectures, one term
Prerequisites: Practical knowledge of at least one computer programming language. Algebra (M329). M418a is a prerequisite for M418b

425 Theory of Numbers
Multiplicative-algebraic theory of numbers. Foundations of natural number theory. Elements of additive-combinatorial number theory.
2 hours lectures
Corequisite: M329 or 341

426 Topology
Continuation of general topology; selected topics from other branches of topology.
2 hours lectures
Prerequisite: M344

428 Lattice Theory
Ordered sets, lattices, and Galois connections. Applications in algebra, geometry and logic.
2 hours lectures
Consent of instructor

429 Combinatorial Topology
Homology theory of complexes. Theorems of invariance, covering, and duality.
2 hours lectures

430 Finite Geometries
2 hours lectures
Corequisite: M330a Projective Geometry

432 Complex Analysis 2
Further properties of holomorphic and meromorphic functions. Riemann surfaces.
2 hours lectures
Prerequisite: M332a or M343

433 Real Analysis 2
An introduction to integration and measure theory with emphasis on the real line.
2 hours lectures
Prerequisite: M332a or 342

434 Differential Equations
435 Laboratory
a) Numerical problems arising in actuarial science and statistics.
3 hours laboratory, one term
Prerequisite – Corequisite: M335b, 461a or consent of instructor
b) Numerical problems arising in actuarial science and statistics
3 hours laboratory, one term
Prerequisite: M336a/b or consent of instructor

Note
Only advanced actuarial students are advised to take this course.

436 Introduction to Logic
An introduction to the logic of sentences and predicates with some emphasis on familiar algebraic structures. At first informal, then leading to a formal axiomatic treatment with proofs of consistency and completeness.
2 hours lectures
Prerequisite: Consent of instructor

437a Measurement of Mortality
Methods of analysis of data to produce raw rates for mortality and other tables.
3 hours lectures, one term
Prerequisite: M235 or consent of instructor

437b Risk Theory
3 hours lectures, one term
Prerequisites: M223, 233 or 243 or consent of instructor

438a 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.
2 hours lectures, one term
Prerequisite: M338a

438b 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.
2 hours lectures, one term
Prerequisite: M438a or permission of instructor

439a Theory of Experimental Design – A
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.
3 hours lectures, one term
Prerequisite: M338a or consent of instructor

439b Theory of Experimental Design – B
Construction and analysis of incomplete designs: latin square, confounded, fractional factorial, incomplete block. Applications.
3 hours lectures, one term
Prerequisite: M338b or consent of instructor

441 Quantum Mechanics
2 hours lectures

442 Theory of Relativity
Flat space-time and special relativity, curved space-time and the Einstein gravitational field equations. The Schwarzschild solutions and the experimental tests of relativity. Maxwell’s equations in space time and the Reissner-Nordstrom solution. Selected topics from cosmology, Petrov classification, spinors, gravitational waves, special solutions, mathematical aspects of the Einstein field equations.
2 hours lectures. Winter term
Prerequisite: M360a. Consent of instructor

443 Electromagnetism
Applications of the Maxwell equations. Reflection and refraction. Introduction to wave guides and antennae.
2 hours lectures. Fall term
Prerequisite: Consent of instructor

444 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.
2 hours lectures, 1 hour tutorial. Winter term
Prerequisite: M445a

445a Fluid Mechanics
Fundamental equations of inviscid fluids, compressibility, vorticity; two and three dimensional irrotational, incompressible flow, Blasius’ theorem, Joukowsky hypothesis.
2 hours lectures, 1 hour tutorial. Fall term
Prerequisite: M363b
445b 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.
2 hours lectures, 1 hour tutorial. Winter term
Prerequisite: M445a

446a History of Mathematics – A
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.
2 hours lectures, one term
Prerequisites: No formal prerequisites are demanded

446b History of Mathematics – B
A study of selected topics from post-renaissance mathematics. Topics include material on prime numbers, Fermat’s Last Theorem, the Gaussian Integers, the Fibonacci Sequence, other topics for elementary number theory, a collection of outstanding problems in geometry (Fagnano, Steiner-Lehmus, Morley).
2 hours lectures, one term
Prerequisites: No formal prerequisites are demanded

447 Statistical Mechanics
Applications of probability theory to theoretical Physics.
2 hours lectures. Fall term

448 Differential Geometry
Differentiable manifolds, tensors and forms, Connexions, Riemannian manifolds.
2 hours lectures
Prerequisites: M229 and 237

449a Experimental Design – A
The requirements for a good experimental design prior to the accumulation of data. The concepts of randomization, replication and experimental error as applied to basic designs; the completely randomized block and latin square designs. Analysis of variance.
2 hours lectures, one term
Prerequisite: M338b or 349a, or consent of instructor

449b Experimental Design – B
Factorial experiments, confounding, fractional replication. Applications of designs. Incomplete block designs. Analysis of covariance.
2 hours lectures, one term
Prerequisite: M449a

450 Applied Analysis
Fourier Series. Vector and matrix methods. Calculus of variations. Other topics in advanced calculus.
2 hours lectures

Note
This course is not for Honours Mathematics students

451a Nonlinear Optimization – A
Recent algorithms for constrained and unconstrained differentiable optimization problems will be presented. Topics will include first and second order Newton methods, quasi-Newton methods, conjugate gradient directions, feasible direction methods, and penalty algorithms. Applications and implementations will be given.
Recommended for students interested in operations research, industrial engineering, computer science and for those wishing to pursue graduate courses in mathematical programming.
2 hours lectures, one term

451b Nonlinear Optimization – B
Nonlinear Programming; convergence conditions and convergence rates for some unconstrained optimization methods, introduction to the Kuhn-Tucker conditions and duality theory for nonlinear programmes, optimality conditions for a quadratic programme.
Quadratic Programming; Lemke’s complementary pivot scheme to solve a quadratic programme.
2 hours lectures, one term
Prerequisite: M455a or consent of the instructor

452a Linear and Integer Programming
(Theory, Applications and Related Topics)
2 hours lectures, one term
Prerequisites: Linear Algebra and Elementary FORTRAN or consent of instructor.
452b Linear and Integer Programming
(Theory, Applications and Related Topics)
Duality theory, Dual Simplex Algorithms, Primal
Dual Algorithms. Assignment Problem, Transpor-
tation Problem. Network problems. Bounded vari-
able problems. Decomposition of large systems.
Formulation of integer, mixed integer, and discrete
programming problems. Methods of solution (Cut-
ting plane methods, implicit enumeration, branch-and-
bound, etc.). Partitioning methods. Applications,
computerized methods of solution.
2 hours lectures, one term  
Prerequisite: M452a or 352a or consent of instructor

453a Queueing Theory – A
Simple queues with Poisson arrival and Exponential
service distributions, multi-server queueing models
including: homogeneous and heterogeneous parallel
servers; servers in series; and phase type service.
Advanced models including: balking, reneging,
jockeying between queues, pre-emptive and non-
preemptive priority queues, batch arrivals and
service processes. Methods of analysis introduced in-
clude differential-difference equations, probability
generating functions and simulation.
2 hours lectures, one term  
Prerequisite: Introductory Probability

454a Game Theory A
A mathematically-oriented course on the basics of
game theory, with applications to economics, bargain-
ing, and strategy.
Classification of games; solution of matrix games
and their relationship to linear programming; infinite
zero-sum games; utility theory; bimatrix games and
the bargaining problem.
2 hours lectures, one term  
Prerequisites: Linear algebra (M229) and basic
probability theory

454b Game Theory B
N-person games; Shapley value; metagames.  
Prerequisites: M454a

455a Mathematical Programming – A
Dynamic Programming; deterministic decision pro-
cess problems, monotonic path problems, equipment
replacement, resource allocation, reduction of dimen-
sion by use of Lagrange multipliers, shortest path
problems, cargo loading problem, the travelling sales-
man problem; introduction to optimal control.
Convex functions; first and second order character-
ization of convex functions.
2 hours lectures, one term  
Prerequisite: M352a or consent of the instructor

456a Scheduling
Single machine job shops, parallel machines, flow-
shop scheduling, the general m/n job shop. Capital
budgeting, distribution problems occurring in
scheduling trucks, trains, and in warehouse move-
ments.
2 hours lectures, one term  
Prerequisite: M352 is recommended but not required

457a This course will be concerned with the combinatorial
problems of retrieving data from a store and discusses
the principal algorithms for doing this. Methods for
constructing appropriate relational structures and
their stability are considered, as well as devices for
improving substantial gains in efficiency.

457b This course considers the application of combinatorial
structures, such as block designs, to information re-
trieval. The construction of such structures will be
considered together with methods for optimising a
general model for the retrieval problem.

458a Graph Theory – A
Topics in graph theory. These may include symmetry
in graphs, planarity, bipartite graphs, minimax
theorems, directed graphs, enumeration, algorithms,
colouring problems, matrices and graphs.
Recommended for students who have taken a
course in graph theory and wish to study additional
topics not normally covered in an introductory
course.
2 hours lecture, one term  
Prerequisite: M351a or consent of instructor

458b Graph Theory – B
Continuation of topics covered in 458a.  
2 hours lectures, one term  
Prerequisite: M458a

459a Algebraic Graph Theory – A
459b Algebraic Graph Theory – B

460a Combinatorics-A
Enumerative Mathematics Combinatorial identities,
generating functions, counting of labelled and un-
labelled objects, theorems of Polya, Redfield-Fead,
and de Bruijn.
Recommended as a useful preliminary for M785
"Planar graphs".
2 hours lectures, one term  
Prerequisite: A knowledge of elementary group
theory (M329)
460b Combinatorics-B
The existence and construction of error correcting codes, projective geometries, orthogonal Latin squares balanced incomplete block designs and other combinatorial configurations.
Recommended for M780, Combinatorial Analysis
2 hours lectures, one term
Prerequisite: Theory of finite groups, rings and fields (M329)

461a Demography
Mathematical applications in demography.
3 hours lectures, one term
Prerequisite or Corequisite: M336 or consent of instructor

461b Topics in Actuarial Mathematics
A selection of topics for the advanced actuarial student.
3 hours lectures, one term

462a Measure and Integration
The theory of measure and the Lebesgue integral.
2 hours lectures. Fall term

462b Linear Operators
Linear operators in Hilbert spaces. Compact operators. Introduction to functional analysis.
2 hours lectures. Winter term

463 Control Theory
2 hours lectures. Fall term
Prerequisite: Consent of instructor

464a Topics in Applied Mathematics
A selection of topics given by members of the Applied Mathematics Department. Typical topics are: elasticity, fluid mechanics, electromagnetic theory, statistical mechanics, perturbation theory, calculus of variation, partial differential equations, distribution theory.
2 hours lectures. Fall term
Prerequisite: Consent of instructor

464b Topics in Applied Mathematics
Same description as in 464a.
2 hours lectures, Winter term
Prerequisite: Consent of instructor

466a Statistical Data Analysis
2 hours lectures, one term
Prerequisites: 1) A course in FORTRAN Programming or equivalent
2) M338b or 349a

466b Topics in Statistics
An introduction to several areas of Statistics, such as multivariate analysis, time series, data analysis, non-parametric theory, decision theory, etc.
2 hours lectures, one term
Prerequisite: M338b or consent of instructor

467a Sampling Theory and Practice
Introduction to sample theory and practice. Elementary sampling designs and estimation procedures. Statistical inference in survey sampling. Interrelationships between survey sampling and the design of experiments.
3 hours lectures, one term
Prerequisite: One of 223, 233 or 243

467b Sample Survey Design
Procedures for construction of sampling designs commonly used in agricultural, economic and scientific surveys, and corresponding estimation techniques. Validation of survey results.
2 hours lectures, one term
Prerequisites: M467a; 338b or 349a

468a Introduction to Convexity and Extrema, and Economic Applications
(not offered in 1975-76)

468b Introduction to Convexity and Extrema, and Economic Applications
(not offered in 1975-76)

469a Statistical Methods with Socio-Economic Applications
2 hours lectures and one hour seminar, one term
Prerequisite: 338(b) or 349(a)
469b Statistical Methods with Socio-Economic Applications
2 hours lectures and one hour seminar, one term
Prerequisite: M469a

470a Numerical Solution of Differential and Integral Equations
3 hours lectures, Fall term
Prerequisite: Consent of the instructor

470b Partial Differential Equations
3 hours lectures, Winter term
Prerequisite: Consent of the instructor

471a Computer Architecture
This course is intended to prepare the student to choose a suitable computer for a given application. Review of combinatorial and sequential logic circuits. Discussion of modules or "building blocks" -- central processing units, stores, input/output systems, and bus structures. Case studies of machines.
3 hours lectures, one term
Offered in the Fall, Winter and Spring terms
Prerequisite: Math 371a

472a Abstract Models of Computation
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.
3 hours lectures, Winter term
Prerequisite: Math 372b

472c Theory of Context Free Languages and Parsing
3 hours lectures, one term
Offered in the Spring and Fall terms
Prerequisite: Math 372b

474a Scientific Applications Software
Practical computing problems encountered in scientific applications: An overview of batch operating systems; the importance of loaders and overlays; Check points, post mortems and operating system services; FORTRAN as a programming language; Current programming techniques: Design and use of program libraries and human engineering of input and output; Magnetic tapes and bulk storage.
3 hours lectures, one term
Prerequisite: Two of Math 314a, Math 314b, Math 334a, Math 334b, Math 340a and Math 340b

474b Principles of Operating Systems
Basic concepts of computer hardware: Program translation; program loading and linking; cooperating sequential processes -- computational and data structures, critical section problem, process synchronization primitives (semaphores, etc.), parallel programming; Introduction to multiprogramming; Operating system nucleus; File systems; Reliability; Protection; System performance, measurement and evaluation.
3 hours lectures, one term
Prerequisite: Two of Math 314a, Math 314b, Math 334a, Math 334b, Math 340a and Math 340b

474a Business Systems Analysis
3 hours lectures, one term
Prerequisite: Math 320a and 320b or 340a and fourth year standing
474d Simulation
Simulation techniques are used to study systems which do not lend themselves to analysis. This course is intended to introduce the basic notions of simulation as well as introduce the student to programming languages for simulation. The course contents will be: An introduction to simulation; random number generators; stochastic processes; modelling; simulation programming languages; the GPSS language.
3 hours lectures, one term
Prerequisite: Math 320a and 320b or 340a and fourth year standing

479 Advanced Topics in Computer Science

480 Functional Equations
Cauchy's, Pexider's and similar equations. Equations for polynomials and for trigonometric functions. Reduction to differential equations. General methods and theorems. Iteration. Applications. Further topics, such as equations for functions of several variables, or equations for analytic functions, or equations on algebraic structures.

499 Readings in Mathematics
2 hours lectures, one term

515 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.
2 hours lectures, 1 hour tutorial per week, one term
Prerequisite: An introductory half course in Statistics

Note
M515 is intended for senior undergraduate and graduate students in faculties other than Mathematics. It cannot be taken for credit towards a Mathematics degree
Course Descriptions

Mechanical Engineering

Assistant Professors
K.G. Adams, B.Sc.(Queen's), M.A.Sc., Ph.D. (Waterloo)
G.C. Andrews, B.A.Sc., M.A.Sc.(British Columbia), Ph.D.(Waterloo)
U.H. Mohaupt, B.A.Sc., M.A.Sc., Ph.D.(Waterloo)
R.J. Pick, B.A.Sc.(British Columbia), M.Sc.(Imperial College, London), Ph.D.(Waterloo)
H.F. Sullivan, B.A.Sc.(Waterloo), A.M., Ph.D. (Princeton)
Research Assistant Professors
S.R. Gollahalli, B.E., M.E.(Bangalore), M.A.Sc., Ph.D. (Waterloo)

Special Lecturers
R.G.R. Lawrence, Q.C.

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. The hours of the core courses are listed in chapter 9. In general, the only prerequisites are the core courses, unless otherwise specified.

Undergraduate Course Descriptions

1 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.

2 Statistics for Engineers


3 Ordinary Differential Equations

4 Numerical Analysis
A survey of numerical procedures with emphasis upon computer implementation using the FORTRAN 4 programming language. In particular, the following topics are covered: Interpolation, curve fitting, solution of non-linear equations, numerical integration, numerical solution of Ordinary Differential Equations, matrix algebra and solution of systems of linear equations, and problems in the solution of partial differential equations.

5 Partial Differential Equations
Modelling physical systems with distributed parameters. Boundary and initial conditions. Division into hyperbolic, parabolic and elliptic equations by means of discriminant.

8 Review of Engineering Mathematics
A revision course in engineering mathematics. Topics include: a review of elementary differential and integral calculus; series; partial derivatives; selected ordinary differential equations; Laplace transforms; Fourier series.

12 Dynamics

15 Structure and Properties of Materials 1
Interatomic bonding, crystal and amorphous structures including typical polymers and ceramics. Structural defects, phase diagrams, diffusion, transformations in metals, corrosion. Some aspects of electrical, magnetic and optical properties.

19 Mechanics of Deformable Solids 1

20 Mechanics of Deformable Solids
A general treatment of the behaviour of structural components from the study of stress and strain in solids. Topics include super-position, energy theorems, theories of failure, elastic and inelastic analysis of unsymmetrical bending, torsion of circular members, columns and stability, and virtual work.

21 Kinematics and Dynamics of Machines

22 Mechanical Design 1
Analysis and synthesis of machine elements. Factors affecting working stresses, fatigue, creep and impact considerations. Design of shafting, springs, screws, clutches, brakes and gear.

30 Structure and Properties of Materials 2
The general principles of stress-strain relationships in all types of materials, including the effects of temperature, strain rate, alloying and microstructure. Different fracture mechanisms and the factors which influence them.

32 Physical Metallurgy 2

33 Experimental Materials Science
This course is designed to acquaint students with materials phenomena using an experimental approach. Microstructural changes and their effects on the mechanical properties in various materials will be studied using such techniques as optical and scanning electron microscopy together with electron probe microanalysis and X-ray analysis. The student may work on a project of his own choice provided it meets the objectives of this course.

35 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.

40 Manufacturing Processes
Course Descriptions
Mechanical Engineering

41 Manufacturing Science 1

42 Principles of Machining

43 Manufacturing Science 4

44 Production Engineering

45 Manufacturing Science 6

46 Manufacturing Science 7
Introduction of polymer processing for mechanical engineers. Elements of polymer science; plastics as a design material. Screw extrusion; elements of non-Newtonian flow and viscometry. Injection moulding. Parameters of polymer conversion operations and their estimation.

47 Analysis and Design of Manufacturing Systems 1

48 Analysis and Design of Manufacturing Systems 2
Analysis and design of the plant layout and materials handling systems as basic components of a manufacturing facility and system. Product range and mix and their effect on these systems. Proven systematic analysis and synthesis and evaluation techniques for efficient and effective plant design.

49 Metrology
Theory and practice of high precision mechanic measurements under strict control conditions—super micrometry; measurements by comparators; profilometry; surface profilography; environmental effects on measurements accuracy; theodolite techniques in the measurements of large structures; collimator applications in machine installation. Tolerances and quality control.

50 Thermodynamics

51 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.

52 Air Conditioning
Thermodynamic properties of moist air; psychrometric charts; humidity measurements; direct water contact processes; heating and cooling of moist air by extended surface coils; solar radiation; heating and cooling of loads on buildings; effects of the thermal environment; air conditioning and calculations; air flow in and around buildings, diffusers.

Prerequisite: ME 54
53 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.

54 Thermodynamics 2
Emphasis on applications of thermodynamics to flow processes, real fluids, evaluation of state functions of real fluids. Thermodynamic analysis of selected devices.

55 Refrigeration Engineering
Methods of refrigeration, refrigerants and their thermodynamic properties, vapour compression systems; actual cycles, simple and complex; survey of refrigeration applications such as preservation of food by quick freeze and long term deep freeze techniques cooling load calculations; calculation of thermal capacities of components such as evaporators, compressors and condensors; refrigerant controls; piping and accessories; defrost methods; miscellaneous processes; cryogenics.
Prerequisite: ME 54

56 Heat Transfer 2
Forced and free laminar and turbulent convection heat transfer in internal and external flows. Special topics selected from current applications.

58 Internal Combustion Engines
Reciprocating SI and CI engines, gas turbines, jets, rockets.
Prerequisite: ME 54

59 Energy Conversion
Applications of fundamental principles of thermodynamics, fluid mechanics, combustion and heat transfer to the design of power plants using fossil and nuclear fuel heat sources. Economics and pollution problems associated with power equipment. Other energy conversion devices such as batteries, fuel cells, solar cells, thermionic and thermoelectric devices and MHD generators.
Prerequisite: ME 54

60 Introduction to Control Systems

62 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.

63 Lubrication Mechanics
A) Lubrication Principles: dry friction, boundary lubrication, hydrodynamic lubrication, rolling elements, squeeze films, metal working lubrication, wear, failure modes.
B) Lubrication applications: sources and types of lubricants, their composition and selection; sliding bearings, rolling bearings, gears, wire rope, hydraulic fluids, metalworking.
C) Project: related to a specific topic in Parts A and B. Lab or theoretical evaluations will be involved in the design of a suitable lubrication system for a specified industrial application.
To be offered in Fall and Spring terms

69 Introduction to the Environment Sciences

82 Mechanical Engineering Projects
Engineering assignments requiring the student to demonstrate initiative and assume responsibility. Student activity is guided and coordinated by faculty supervisor. In selecting projects, particular account is taken of the students' field of specialization. Projects, in general, involve technical disciplines beyond the strictly mechanical engineering field. 5 hours Laboratory

100 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 Law 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.
200 Introduction to Mechanical Engineering 1
Discussion of structure of Mechanical Engineering curriculum, operation of Department, Faculty, University, technical societies.
1 hour, non-credit

300 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.
1 hour, non-credit

400 Introduction to Mechanical Engineering 3
Research frontiers in Mechanical Engineering, specific discussion of research done at Waterloo, seminars by members of research groups.
1 hour, non-credit

523 Mechanical Design 2
Principles of optimum design of machine elements; minimum cost, minimum weight, maximum power, etc. Statistical considerations in factors of safety and tolerances. Effect of manufacturing errors on product performance. Introduction to value engineering and reliability.
Prerequisite: ME 22

524 Advanced Dynamics
A second course in engineering dynamics, inerter tensor and Euler's Equations, energy methods, gyroscopic motion, generalized co-ordinates and Lagrange Equations, vibrations.

525 Mechanical Vibrations in Machines

527 Mechanics of Deformable Solids 3

528 Experimental Mechanics
Experimental methods of static and dynamic stress analysis; strain gauges, brittle coatings, photoelasticity, moire fringes, analogues. Selected related topics: flaw detection, vibration measurement, use of statistical methods, error analysis and curve fitting.

531 Physical Metallurgy 1

534 Properties of Polymers

537 Ceramics
The crystallography of ionic and covalent compounds. The vitreous state. Important phase diagrams in oxide-ceramic systems. Production methods for glass, porcelain and graphite shapes. Properties and applications of special ceramics.

544 Manufacturing Science 5
Welding. Static and dynamic design of welded details. Temperature distributions, distortion and residual stresses. Solidification in welding. Fracture modes and mechanical destructive tests.

547 Statistical Quality Control and Reliability Engineering

548 Numerical Control of Machine Tools 1

555 Thermodynamics 3
Chemical equilibrium, multiconstituent fluid phases, additional topics in statistical thermodynamics, introduction to thermodynamics of irreversible processes.
557 Combustion 1
Combustion thermodynamics; Introductory 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.

560 Instrumentation
Choice of instrumentation systems, sensing devices and conversion devices. Examples and experiments of techniques used in the measurement of flow, pressure, temperature, position, velocity acceleration, strain, sound, surface finish and dimensions.

561 Fluid Power Control System

562 Introduction to Automation

563 Turbomachines

565 Gas Dynamics
Basic laws of compressible fluid flow. Wave propagation in compressible fluids, isentropic flow of a perfect gas, normal and oblique shock waves, Prandtl-Meyer flow. Flow in ducts and over bodies, flow with frictions (Fanno) and heat transfer (Rayleigh). Imperfect gas effects, measurement of compressible flows, use of formulae, charts and tables, introduction to the method of characteristics.

566 Fluid Mechanics 3
Prerequisite: ME 62

568 Noise Analysis and Control

569 Industrial Fluid Mechanics
A study of industrial 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.

570 Geophysical Fluid Dynamics 1
Hydrodynamic equations of motion on a rotating earth. Geostrophic balance in the atmosphere and oceans, vertical variation of wind and pressure fields in the atmosphere, mechanisms of pressure change, vorticity equation.

571 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, thermal, jets in stratified flow, radioactive plumes, particulate dispersion, instrumentation (micrometeorological), air pollution control techniques and equipment monitoring instrumentation.

572 Ocean Engineering
This course will deal with a number of topics from the broad spectrum of engineering problems in the aquatic environment. Subjects discussed may include structures (open, solid, floating, submerged), vehicles (surface, substructure, bottom) and shore processes. Treatment of the phenomena and the particular properties of the medium, which make the solution of engineering problems in this area more challenging, will be treated (mainly from the descriptive point of view). Usually a seminar and/or essay will be an important part of the course work-load.
School of Optometry

Professor, Director of School
E.J. Fisher, B.A., M.A.(Toronto), D.Sc.(Penn. College of Optometry)

Professors
C.W. Bobier, O.D.(College of Optometry of Ontario), B.A.(Toronto), M.S.(Ohio State)
W.S. Long, O.D.(College of Optometry of Ontario), B.A.(Toronto)
W.M. Lyle, O.D.(College of Optometry of Ontario), M.S., Ph.D.(Indiana)
F. Van Nus, B.A., B.Sc.(Western Michigan), O.D., M.S.(Indiana)
M.E. Woodruff, O.D.(College of Optometry of Ontario), Ph.D.(Indiana)

Associate Professors
J.D. Moreland, B.Sc.(London), D.I.C., Ph.D.(Imperial College)
A. Remole, O.D.(College of Optometry of Ontario), B.F.A.(Manitoba), M.S., Ph.D.(Indiana)
G.C.S. Woo., O.D.(College of Optometry of Ontario), M.S., Ph.D.(Indiana)

Assistant Professors
R.D. Beauchamp, B.A.(McMaster), M.A., Ph.D. (Brown)
M.G.E. Callender, O.D.(College of Optometry of Ontario), B.Sc.(S.G.W.I.), M.Sc.(Waterloo)
J.G. Sivak, L.Sc.O.(Montreal), M.S.(Indiana), Ph.D. (Cornell)
T.D. Williams, O.D.(College of Optometry of Ontario), M.S.(Indiana)

Adjunct Professors
D.E. Andrew, B.A., M.D.(Toronto)
I. Baker, O.D.(College of Optometry of Ontario)
A.E. Chalet, M.Sc. Pharm.
D.H. Lamont, B.A.(Toronto), Q.C.
C.W. Schwenger, M.D., D.P.H.(Toronto)
G.W. Wyszcecki, Dipl.Ing., Dr.Ing.(Tech. Univ., Berlin)

Visiting Professors (1974-1975)
W.D. Wright, A.R.C.S., D.I.C., Ph.D., D.Sc.(London)

Clinic Residents (1974-1975)
T.L. Adamack, B.A.(Saskatchewan), O.D.(Waterloo)
M.L. Cook, O.D.(Waterloo)
R.A. Di Pietro, B.A., B.S.(California, Davis), B.S., O.D.(California, Berkeley)
C.S. Hayes, O.D.(Waterloo)
D.A. Hayhoe, O.D.(Waterloo)
J.A. Holmes, O.D.(Waterloo)
D.I. Knoho, B.S., O.D.(California, Berkeley)
R.A. MacKay, O.D.(Waterloo)
A. Nizza, B.S.(Loyola, L.A.), B.S., O.D.(S. California College of Optometry)
R.J. Pace, O.D.(Waterloo)
D.P. Rieder, B.S., O.D.(California, Berkeley)
W.C. Schrader, B.S.(California, Davis), B.S., O.D. (California, Berkeley)
S.S. Smith, O.D.(Waterloo)
R.L. Trump, O.D.(Waterloo)
J.D. Wong, A.B., B.S., O.D.(California, Berkeley)

Clinical Associates (1974-75)
W.R. Andrews, O.D.(College of Optometry of Ontario)
A.J. Baldock, O.D.(College of Optometry of Ontario)
R.R. Bock, O.D.(College of Optometry of Ontario)
J.D. Capell, O.D.(Waterloo)
R.R. Chen, O.D.(College of Optometry of Ontario)
K. Chhatwal, O.D.(Waterloo)
G.A. Grant, O.D.(College of Optometry of Ontario)
Y. Grant, O.D.(College of Optometry of Ontario)
M. Gross, B.Sc.(Toronto), O.D.(Waterloo)
F. Jaggard, O.D.(Waterloo)
A.J. MacKinnon, O.D.(College of Optometry of Ontario)
M.S. Munn, Dip. Opt.(College of Optometry of Ontario)
C.G. Nicol, O.D.(College of Optometry of Ontario)
R.D. Pellowe, O.D.(College of Optometry of Ontario)
S. Peta, O.D.(Waterloo)
J.M. Robertson, Dip. Opt.(College of Optometry of Ontario)
W.M. Rowe, O.D.(College of Optometry of Ontario)
S.A. Salsberg, O.D.(College of Optometry of Ontario)
C. Santone, O.D.(Waterloo)
R. Scheid, O.D.(Waterloo)
W. Shilman, Dip. Opt.(College of Optometry of Ontario)
J. Turnbull, B.A.(Toronto), O.D.(College of Optometry of Ontario)
G.R. Virgin, O.D.(College of Optometry of Ontario)
A. Williams, O.D.(College of Optometry of Ontario)
B. Wiseman, B.Sc.(McGill), O.D.(Waterloo)
Undergraduate Course Descriptions

Students in other disciplines may register for Optometry courses only upon the approval of the Director of the School of Optometry.

200* History and Orientation
A brief history of the profession; a review of the development of visual science; a consideration of legal and organizational development of optometry; the role of professional associations. The scope and nature of optometrical practice and the relationship of the profession to other professions and the community.
2 lectures, Fall term

206* Geometrical Optics
Prerequisites: a course in first year Physics; Mathematics 130
3 lectures, 3 hours laboratory, Fall term

211* Physiological Optics
Prerequisite: Optometry 206*
3 lectures, 3 hours laboratory, Fall term

224* Anatomy of the Eye and Associated Structures
The gross, microscopic and ultra structure of ocular tissues will be examined in detail. Extensive dissection of various eyes will be completed. Bone and other supportive structure will be studied in the laboratory with emphasis directed toward application of anatomical knowledge to related courses in pathology and clinical optometry. Embryology and Comparative Anatomy are included.
No credit will be given for this course until the student has successfully completed Optometry 234*
Corequisite: Biology 201
3 lectures, 3 hours laboratory, Fall term

234* Anatomy of the Eye and Associated Structures
A continuation of Optometry 224*.
Prerequisite: Optometry 224*
3 lectures, 2 hours laboratory, Winter term

301* Physiological Optics
Ocular motility: description and analysis of eye movements, measurement of eye movements, the innervational systems of the extraocular and intraocular musculature.
Prerequisite: Optometry 211*
3 lectures, 3 hours laboratory, Fall term

302* Clinical Optometry
Lectures on clinical techniques for examination of the optical properties of the eye. Included will be - measurement of the visual acuity, theory and practice of retinoscopy, ophthalmoscopy, keratometry, subjective sight testing, measurement of amplitude of accommodation, and calculation of reading addition. A laboratory course in which these techniques will be demonstrated and practised will run concurrently.
Prerequisite: Optometry 211*
3 lectures, 3 hours laboratory, Fall term

305* General Pathology
A study of the basic disease processes including inflammation, degeneration, neoplasia. The properties of pathogenic micro-organisms and the specific diseases with which they are associated. Resistance, immunity, hypersensitivity. Diseases caused by physical agents other than microorganisms. Principal diseases affecting each organ system.
Prerequisite: Biology 201, Optometry 224*-234*
3 lectures, 1 hour tutorial, Fall term

306* Optometrical Optics
The history and manufacture of optical glass, ophthalmic lens surfacing and design, classification and performance of single vision ophthalmic lenses, prismatic effects, transposition, absorptive lenses and lens coating, problems and solutions in fitting ophthalmic lenses to the eyes. The laboratory course deals with processing all types of ophthalmic material, as well as optical bench experiments.
Prerequisite: Optometry 206*
3 lectures, 4 hours laboratory, Fall term

311* Physiological Optics
The Visual Process: retinal structure; photopigments; photoreception; electrophysiology of the retina and higher centres. Psychophysics of Vision: light and dark adaptation; spatial and temporal light discrimination.
Prerequisite: Optometry 301*
3 lectures, 3 hours laboratory, Winter term
312* Clinical Optometry
Clinical techniques for the examination of the binocular relations of the non-strabismic patient, with particular emphasis on the study of the relationship between accommodation and convergence; techniques of phorometry, prism vergence tests, relative accommodation tests, dynamic retinoscopy, and monocular and binocular cross cylinder tests.
Prerequisite: Optometry 301*, 302*
3 lectures, 3 hours laboratory, Winter term

315* General Pathology
A continuation of 305*.
Prerequisite: Optometry 305*
4 lectures, 1 hour tutorial, Winter term

316* Optometrical Optics
A continuation of 306*, dealing with problems peculiar to bifocal and multifocal lenses. Aberrations of thin lenses and the design of lenses for ophthalmic use.
Prerequisite: Optometry 306*
3 lectures, 4 hours laboratory, Winter term

401* Physiological Optics
Prerequisites: Optometry 301*, 311*
3 lectures, 3 hours laboratory, Winter term

402* Clinical Optometry
The sequence of testing in the clinical examination will be outlined. Stress will be on case history, tests of the integrity of the visual system, tests of the refractive properties, and tests of binocular relations. The integration of these tests into a satisfactory clinical analysis and modes of treatment will constitute a large part of the course.
Prerequisites: Optometry 302*, 312*
3 lectures, 2 hours laboratory, Fall term

404* 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.
Prerequisite: Optometry 224*
2 lectures, 2 hours laboratory, Fall term

405* Ocular Pathology
Prerequisite: Optometry 305*, 315*
3 lectures, 1 hour lab. bacteriology, Fall term

406* Optometrical Optics
The lecture course will deal with the problems involved in the selecting, preparing and fitting ophthalmic materials. Consideration of cosmetic and comfort requirements. The laboratory course will give the student experience in working with lenses and frames as he prepares ophthalmic materials for clinic patients.
Prerequisites: Optometry 306*, 316*
2 lectures, 4 hours laboratory, Fall term

407* Optometric Specialties: Contact Lenses
A series of lectures and laboratories on the principles and procedures of prescribing and fitting contact lenses.
Prerequisites: Optometry 401*, 402*
2 lectures, 2 hours laboratory, Fall term

408* Optometry Clinic
The student is assigned to the Visual Analysis Clinic and under the direct supervision of optometrists of the clinic staff, carries out routine clinical investigations of patients who attend the public clinic. No credit will be given for this course until the student has successfully completed Optometry 418*
Prerequisite: Permission of Clinic Director
8 hours clinic, Fall term

409* Light and Illumination
Light sources, transmitting and reflecting surfaces; principles of radiometry and photometry; illumination and related factors involved in the control of the visual environment.
2 lectures, 2 hours laboratory, Fall term

411* 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.
Prerequisite: Optometry 401*
3 lectures, 3 hours laboratory
412* Clinical Optometry
A continuation of 402*. The detection of strabismus and techniques for testing the sensory and motor characteristics of the strabismic patient. The aim will be to allow the student to evaluate the likelihood of achieving a cure by non surgical means. The techniques of orthoptics and visual training by which a rehabilitation of vision can be attempted will be described and demonstrated.

Prerequisites: Optometry 302*, 312*, 402*
3 lectures, 2 hours laboratory, Winter term

414* Physiology of the Visual Systems
The neural processing of an image by the retina. Transmission of colour, brightness borders, and movement to the lateral geniculate, superior colliculus and cortex. Neural basis of binocular depth perception, accommodation, convergence and other eye movements. The effects of deprivation on development of the visual nervous system.

Prerequisite: Optometry 404*
3 lectures, 2 hours laboratory, Winter term

415* Ocular Pathology
A continuation of 405*.

Prerequisite: Optometry 405*
3 lectures, 1 hour laboratory, Winter term

418* Optometry Clinic
A continuation of 408*.

Prerequisite: Optometry 408*
8 hours clinic, Winter term

427* 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.

Prerequisites: Optometry 401*, 402*
2 lectures, 2 hours laboratory, Winter term

428* Summer Clinic
Each student is required to complete 120 hours of clinical practice during the summer term. Times will be arranged by the student with the approval of the clinic staff. This is a 1.0 credit course.

Prerequisite: Successful completion of complete Year 4 programme

500* Optometrical Jurisprudence and Praxis
Lectures on laws governing the practice of Optometry in Canada and laws relating to the rights and responsibilities of the optometrist in his relations with his patients; the establishment and management of optometric practice; economics, taxes, insurance, accounting, office design, mode of practice, professional organization and societies.

2 lectures, Fall term

501* Physiological Optics
Assignments will include preparing for seminars on topics of interest, reviews, library and laboratory researches by individuals or small groups. Consideration will be given to the individual student's special interests. Students who have demonstrated a particular interest in research in this area may elect this course as an alternative to Psychology 357*; Optometry 513*.

Prerequisites: Optometry 401*, 411*
3 hours, Fall term

502* Advanced Clinical Optometry
The lecture portion of this course will deal with special techniques of clinical optometry for examination of refractive properties and binocular relations; techniques of binocular refraction, prism adaptation; etiology of refractive errors and change of refraction with age; seminars and the presentation of clinical case reports by the student for defense and criticism will constitute a part of the course.

Prerequisites: Optometry 302*, 312*, 402*, 412*
3 lectures, Fall term

504* Ocular Pharmacology
Neurohumoral theory, response to drugs, sterile techniques, disinfectants. Drugs used in contact lens practice, drugs used topically on the eye, drugs used as diagnostic aids. Side effects of all drugs on the eye and vision.

Prerequisites: Optometry 404*, 405*, 415*
3 lectures, 1 hour laboratory, Fall term

508* Optometry Clinic
The clinical programme teaches the student how to care for a variety of patients ranging in age from infants to the elderly and presenting a full spectrum of vision problems. Specific clinical departments provide instruction and experience in the techniques of pathology detection, contact lens application, strabismus evaluation, orthoptics and vision training and the care of patients with low vision or those with perceptual problems.

No credit will be given for this course until successful completion of Optometry 518*.

Prerequisite: Permission of Clinic Director
24 hours per week, Fall term
509* Community Health Optometry
This course deals with governmental and social organization of health and vision care and the optometric role within the evolving system. Aspects of the epidemiology of vision anomalies are examined with the view toward application of such knowledge to levels of prevention. The course will also explore the special problems in vision care, with emphasis on their management, that arise in industry, in the case of the mentally retarded and in the case of the pediatric and geriatric elements of the population.
4 lectures, Fall term

510* Optometrical Jurisprudence and Praxis
A continuation of 500*.
Prerequisite: Optometry 500
2 lectures, Winter term

511* Physiological Optics
A continuation of 501*.
Prerequisite: Optometry 501
3 hours, Winter term

512* Advanced Clinical Optometry
A continuation of Optometry 502*.
Prerequisite: Optometry 502*
3 lectures, Winter term

513* Optometric Communication
This course deals with aspects of communication, control and motivation in optometric clinical practice. Verbal communication with the patient during and at the conclusion of the visual examination will be emphasized along with intra- and inter-professional referral methods. Special problems arising with elderly patients and children will be reviewed. The student will be asked to evaluate his own aims and skills in these matters.
2 lectures, Winter term

514* 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 counseling, and the detection of carriers.
Prerequisites: Optometry 405*, 415*
2 lectures, Winter term

518* Optometry Clinic
A continuation of 508*.
Prerequisite: Optometry 508*
24 hours clinic, Winter term

519* Community Health Optometry
A continuation of 509*.
4 lectures, Winter term
Department of Philosophy

Associate Professor, Chairman of Department
J.R. Horne, B.A., M.A. (Western Ontario), B.Th. (Huron), Ph.D. (Columbia)

Associate Professor, Associate Chairman
J.W. Van Evra, B.A. (Valparaiso), M.A., Ph.D. (Michigan State)

Professors
T.L. Batke, B.A.Sc., M.A.Sc., Ph.D. (Toronto)
R.A. George, M.A., Ph.D. (Michigan State)
L.L. Haworth, B.A. (Rollins), M.A., Ph.D. (Illinois)
J.S. Minas, B.A. (Wayne), Ph.D. (Illinois)
P. Seligman, B.A., Ph.D. (London)
J.W. Tucker, B.Sc., B.A., Ph.D. (London)

Associate Professors
W.R. Abbott, B.A. (Kenyon), Ph.D. (Ohio State)
E.J. Ashworth (Miss), B.A., M.A. (Cambridge), Ph.D. (Bryn Mawr)
F. Centore, B.Sc. (Canisius), M.A. (Haryland), Ph.D. (St. John's) J
B.P. Hendley, B.A. (Marquette), M.A., Ph.D. (Yale)
J. Huertas-Jourda, B.A. (Florida), M.A., Ph.D. (New York) (part-time)
A.C. Minas (Mrs.), B.A. (Radcliffe), M.A., Ph.D. (Harvard)
D.D. Roberts, B.A. (Roosevelt), M.A., Ph.D. (Illinois)

Assistant Professors
E.F. Bertoldi, B.A., M.A. (Windsor), Ph.D. (Waterloo) (part-time)
G.T. Campbell, B.A. (Western Ontario), Ph.L. Ph.D. (Laval) J
D.T. DeMarco, B.S. (Stonehill, Mass.), M.A., Ph.D. (St. John's) J
R.H. Holmes, B.A., M.A. (Montana), Ph.D. (Washington) (on Sabbatical Leave)
M.F. McDonald, B.A. (Toronto), M.A., Ph.D. (Pittsburgh)
J. Wubnig, (Miss), B.A. (Swarthmore), M.A., Ph.D. (Yale)

Faculty members holding cross appointments as shown
1 Philosophy and Chemical Engineering
2 Philosophy and Mathematics

Note 1
Courses 370* to 372*, 380* to 389*, 435* to 439*; 440* to 444*; 471* to 473*; 480* to 489*; are special courses offered in response to student demand or special interests of the faculty. The Department will publish each Spring a list of the courses offered under these numbers for the following academic year. This list will include descriptions of those courses whose content is not specified below and names of instructors for each course.

Note 2
Any full course or two half courses in Philosophy can be used to satisfy the group A(i) requirement.

Note 3
Courses suffixed with 'I' are administered by St. Jerome's College; those suffixed with a 'P' are administered by St. Paul's College; and those suffixed with an 'R' are administered by Renison College.

Note to General Philosophy Students
Five full course equivalents in Philosophy are required for the General Degree in Philosophy, including 140* (or 240), 221* and one full-course equivalent from 280*/282*, 282*/283*, 390*/391*. (St. Jerome's students: see p. 397 for further information.

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

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

Undergraduate Course Descriptions

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.

100 Introduction to Philosophy
A broad selection of the main problems in philosophy will be considered. For example: How can we know whether anything is right or wrong? How can we know about things we cannot directly observe? Can we know whether there is a God? Is mind in any sense distinct from matter? Original texts of both classical and contemporary thinkers are employed.
No prerequisite
3 hours
110 Problems
An introduction to philosophical thinking through an examination of problems that concern the student. The course will begin with a general discussion of problematic aspects of contemporary life. We will then focus in on specific topics and consider them in light of relevant philosophical approaches. Readings to be used will depend on the topics emerging from the discussion.
No prerequisite
3 hours

125* Fundamentals of Social and Political Philosophy
Introduction to the basic value-questions about politics and society. Various theories about the meaning and basis of rights, political obligation, justice, law, and government are examined. Both classical writers such as Plato, Hobbes, Locke, Mill, and Marx and contemporary writers such as Rawls may be used. Application to various issues, such as civil disobedience, participatory democracy, racial and sexual discrimination, and socialism versus capitalism will be included.
No prerequisite
3 hours

135* Fundamentals of the Philosophy of Religion
A philosophical consideration of problematic aspects of religious belief. Topics to be discussed will include: attempts to prove the existence of God, the problem of evil, faith and reason, religious experience, and religious language. Classical and contemporary readings will be used.
No prerequisite
3 hours

140* Fundamentals of Logic
Basic types of reasoning will be analyzed. The reasons for using symbols in logic will be explored, and some simple systems considered. Attention will also be devoted to informal arguments and scientific method.
No prerequisite
3 hours

150* Knowledge and Reality
Discussion of the nature of reality. Rival theories concerning mind, matter, freedom, the existence of God, and the place of experience and reason in human knowledge.
No prerequisite
3 hours

201* Love
A philosophical analysis of different forms and functions of love. Among the topics to be considered: love and sexuality, religious love, love and knowledge. Classical and contemporary sources will be treated.
No prerequisite
3 hours

210* Philosophical Literature
Certain works of literature will be studied for their relevance to philosophical problems. Those interested in this course may consult the Department regarding which works of literature are to be studied in any given year.
No prerequisite
3 hours

221* Ethics 1
This course is intended to be both a history of and an introduction to moral philosophy. In this course the views on the foundations of ethics of the great philosophers from classical antiquity to about 1900 are systematically examined. Such philosophers as Plato, Aristotle, Aquinas, Hobbes, Hume, Kant, Mill and Nietzsche will be included.
No prerequisite
3 hours

222* Contemporary Ethical Theory
This course has two aims: to continue the history of ethics begun in Philosophy 221* with writings from 1900 to the present, and to discuss systematically the foundations of ethics from the most current perspective. Theories such as intuitionism, emotivism, utilitarianism, and relativism are examined via the writings of such people as Moore, Stevenson, Baier, Hare, and Warnock.
No prerequisite; Philosophy 221* recommended
3 hours

223 Moral and Social Philosophy
An investigation of what constitutes the good life and the good society through the study of different theories. Such topics as the role of reason, the nature of the good, right and wrong, justice, individual rights, ecology, human nature and animal behaviour will form the principal subject-matter. Both classical and contemporary readings are employed.
Prerequisite: Second year standing or consent of instructor
3 hours
224* 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 man-
kinds toward nature will be examined.
No prerequisite
3 hours

225* Social and Political Philosophy: Canadian
Problems
This course is a philosophical study of various Can-
adian social and political problems such as the Crim-
inal Code's regulation of morals, foreign control, the
value of nationalism, the redistribution of wealth,
native rights, and the War Measures Act. Canadian
socialist, liberal, conservative, and anarchist ap-
proaches to such problems will be examined from a
moral point of view.
Prerequisite: Philosophy 125* or consent of instructor
3 hours

235* Philosophy and Mysticism
A critical examination of mystical writings, with re-
gard to the nature of the experience reported, their
typology, and their implications for epistemology,
ethics, and philosophy of religion.
No prerequisite
2 hours

236* Philosophy of Religion: The Occult
A critical philosophical discussion of reports of sev-
eral kinds of extraordinary experiences, such as
magic, extra-sensory perception, mysticism, and divin-
ation. Our consideration of rival explanations of such
experiences will lead us to discussions of such con-
cepts as insanity, irrationality, the supernatural, and
the miraculous.
No prerequisite
2 hours

240 Logic
A systematic development of the propositional cal-
culus and of the first-order functional calculus. Some
attention will be devoted to extensions to, and inter-
pretations of, such formal systems.
Prerequisite: None for second-year students and
above; consent of instructor for others
3 hours

250* Knowledge and Reality (French)
As 150*, but this course will be taught in French.
(Cross-numbered as French 385*)
Prerequisite: Consent of instructor
3 hours

258* 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.
No prerequisite
3 hours

265* 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.
No prerequisite
3 hours

270* 271* 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 in-
clude Philosophical Anthropology, Philosophy and
linguistics theory, Minds and Machines, The Concept
of Deviance.
No prerequisite
3 hours

280* History of Ancient Philosophy 1
From the beginnings to Plato.
Prerequisite: Second year standing or above; or
consent of instructor
3 hours

281* History of Ancient Philosophy 2
From Aristotle to the close of classical antiquity.
Prerequisite: Philosophy 280*
3 hours

282* History of Modern Philosophy 1
Earlier period beginning with Descartes.
Prerequisite: Second year standing or above, or
consent of instructor
3 hours

283* History of Modern Philosophy 2
Later period including Hume and Kant.
Prerequisite: Second year standing or above, or
consent of instructor
Philosophy 282* recommended
3 hours

284* 19th Century Philosophy
The 19th century. Philosophers covered may include
Hegel, Mill, Schopenhauer, James, and Kierkegaard.
No prerequisite
3 hours
Philosophy

285* 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.

No prerequisite
3 hours

300* 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.

No prerequisite
3 hours

301* 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 problems and currently disputed issues, such as abortion, euthanasia, capital punishment, use of violence for political ends, and others. Choice of issues largely determined by student interest.

Prerequisite: At least second year standing or consent of instructor
3 hours

311* 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.

Prerequisite: At least second year standing or consent of instructor
3 hours

312* Philosophy of Education 2
Critical evaluation of selected problems of education in an attempt to relate theory to practice. Recent Canadian studies will be among those considered.

Prerequisite: Philosophy 311* or consent of instructor
3 hours

321*/324* 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.

Prerequisite: Philosophy 221*/222*
3 hours

See Note 1

Course Descriptions

325* Political Philosophy 1
Philosophical analysis of central concepts in political theory and its relation to moral and metaphysical problems of various periods.

Prerequisite: One full or two half Philosophy courses
3 hours

326* Political Philosophy 2
A detailed discussion of contemporary theories.

Prerequisite: Philosophy 325*, or consent of instructor
3 hours

327* Philosophy of Law
Besides considering some of the more prominent views of what law is (e.g., those of Aquinas, Kant, Austin, Kelsen, and Hart), we will examine the relationships between law and morality. We will also take up some other topics central to Jurisprudence, such as liability, right, and judicial reasoning.

Prerequisite: One full or two half Philosophy courses or consent of instructor
3 hours

328* 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. Little or no attention is devoted to secondary sources or recent developments of Marxian theory, though some recent interpretative and critical work is used.

Prerequisite: One full or two half Philosophy courses, or consent of instructor
3 hours

331* 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.

Prerequisite: One full or two half Philosophy courses
3 hours

335* 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.

Prerequisite: One full or two half Philosophy courses
3 hours
340 Logical Theory
A rigorous development of the propositional and predicate calculus in a general framework, an examination of various alternative calculi, and a study of such concepts as completeness, consistency, extensionality, etc. from both formal and philosophical points of view. Intended primarily for those interested in philosophical issues connected with logic.
Prerequisite: Philosophy 140*, or (preferably) Philosophy 240, or consent of instructor
3 hours

341* Decision and Value Theory
A systematic study of the basic concepts in decision-making theories and their associated value theories with special emphasis on the definition and measurement of utility functions and on various criteria used in uncertainty and in risk situations; some reference to applications in Economics, Political Science, Psychology, and Statistics.
Prerequisite: Consent of instructor
3 hours

350 Epistemology
An analysis of human knowledge, its conditions and types. The first part concentrates on criteria of meaningfulness, verification, the possibility of a priori knowledge, and the concept of knowledge. The second part deals primarily with the character and possibility of our knowledge of the physical world, other minds, and the like.
Prerequisite: One full or two half courses in Philosophy
3 hours

350A* Epistemology 1
The first part of Philosophy 350.
Prerequisite: one full or two half courses in Philosophy
3 hours

350B* Epistemology 2
The second part of Philosophy 350.
Prerequisite: One full or two half courses in Philosophy
3 hours

Note
Either 350A* or 350B* may be taken separately

359* 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.
Prerequisite: At least second year standing or consent of instructor
3 hours

362* Philosophy of Social Science
Problems about the fundamental methods and aims of the social sciences generally, and problems specific to Psychology, Sociology, Political Science, etc., and their relations to one another will be considered.
(Cross-numbered as Sociology 371*)
No prerequisite
3 hours

363 Philosophy of Language and Linguistic Analysis
The first part of this course deals with issues in the area of philosophy of language, such as necessary truth, analyticity, propositions, theories of meaning, semantics, reference and speech acts. The second part will consider ordinary language analysis as a method for solving philosophical problems. Criticisms of this method, including comparison with structural linguistics, will be discussed.
Prerequisite: Consent of instructor, or honours status in Philosophy
3 hours

363A* Philosophy of Language
The first part of Philosophy 363.
Prerequisite: Consent of instructor, or honours status in Philosophy
3 hours

363B* Linguistic Analysis
The second part of Philosophy 363.
Prerequisite: Consent of instructor, or honours status in Philosophy
3 hours

Note
Either 363A* or 363B* may be taken separately

365*-366* 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.
Prerequisite: Consent of instructor
3 hours

370*-372* Special Subjects
One or more half courses will be offered at different times as announced by the Department.
Prerequisite: Consent of instructor
3 hours

See Note 1
380*-389* 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.
Prerequisite: Philosophy 280*|281* and 282*|283*
3 hours
See Note 1

390* Medieval Philosophy 1
The early period to the 13th century. Among those considered will be: Augustine, Boethius, Anselm, and Abailard.
Prerequisite: Philosophy 280*|281*
3 hours

391* Medieval Philosophy 2
The later period from the 13th century. Among those considered will be: Bonaventure, Aquinas, Scotus, and Ockham.
Prerequisite: Philosophy 390*
3 hours

398(a-b)* Directed Reading in Special Areas
Prerequisite: Consent of instructor

399 Tutorial for Honours Students
Students wishing to enrol in 399 should consult the Department.

425* 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.
Prerequisite: One half Philosophy course
3 hours

435*-439* Studies in Philosophy of Religion
A study of a particular philosopher or problem. The topic will be announced in advance each year.
Prerequisite: Consent of instructor
3 hours
See Note 1

440*-444* 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.
Prerequisite: Philosophy 240 or Mathematics 436
3 hours
See Note 1

446* Philosophy of History
Consideration of various possible views about ultimate nature of history and historical knowledge.
Offered in sequence with History 466*.
Prerequisite: One full course in Philosophy, or consent of instructor
3 hours

455 Metaphysics
Theories of reality, historical and contemporary, with emphasis on metaphysical problems in the light of recent studies.
Prerequisite: Two full courses in Philosophy
3 hours

465 Existential Philosophy
An in depth study of the thought of some major existentialist figures such as Kierkegaard, Unamuno, Nietzsche, Heidegger, Sartre, Camus, Marcel, Jaspers, Ortega y Gasset.
Prerequisite: Consent of instructor
3 hours

470 Phenomenology
A critical examination of the issues and methods of phenomenology. The basic writings of phenomenologists such as Husserl and Merleau-Ponty will be the main texts. Such a critique will include the attempt to understand the uses and ramifications of phenomenological methods through the working out of a particular analyses.
Prerequisite: One full or two half courses in Philosophy, or consent of instructor
3 hours

471*-374 Problems
One or more half courses will be offered at different times, as announced by the Department.
Prerequisite: Consent of instructor
3 hours
See Note 1

480*-489 Advanced Studies in the History of Philosophy
Various half courses dealing with a particular philosopher, a selected work or period; one or more of these will be offered each year as announced by the Department.
Prerequisite: Consent of instructor
3 hours
See Note 1
Course Descriptions
Philosophy

490(a-b)* Directed Reading in Special Areas
Prerequisite: Consent of instructor

499 Tutorial and Honours Essay
Students wishing to enrol in 499 should consult the Department.

The following courses are administered by St. Jerome's College

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

General Programme: Phil 200J* or 140* or 240, 218J* or 221*, two halves of 280*-1*, 282*-3*, 390*-1*, plus 2.5 to 3 other philosophy electives.

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

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

100J Introduction to Philosophy
A broad selection of the main problems in philosophy will be considered. For example: How can we know whether anything is right or wrong? How can we know about things we cannot directly observe? Can we know whether there is a God? Is mind in any sense distinct from matter? Original texts of both classical and contemporary thinkers are employed. Year course. 3 hours

120J* Philosophy of Life and Death
A study of what some of the great philosophers have said about the meaning of life in relation to death and the transition from life to death. Possible topics for discussion are Plato's views on the soul, Aristotle's denial of personal immortality, James's use of the "world soul", and Whitehead's attempt to unite God and the world. Students are urged to raise their own questions and thereby help direct discussion.
Fall term. 3 hours

130J* Philosophy of Discontent
A study of what some of the great philosophers have said about the causes of personal and social discontent. The role of the "philosopher-king," the need for social disobedience, the philosophical justifications for anti-authoritarian and anti-social behaviour, and the extent to which ethical principles can be altered to accommodate changing conditions, are possible topics for discussion.
Winter term. 3 hours
200J* Intentional Logic
Are you a logical person? What does it mean when someone says “that’s not logical,” or “from the logical point of view . . .”? This course regards logic as a tool in guiding our penetration of various substantive issues in philosophy. It will cover the main common logical fallacies, term logic, propositional logic, and syllogistic logic. The difference between intentional logic and mathematical logic will be discussed.
Fall term
No prerequisite. 3 hours

205J* Elements of the Philosophy of Science
An examination through conceptual analysis and historical reference of the explanatory principles underlying the material world. Various main doctrines (e.g. pythagoreanism, atomism, hylomorphism) will be compared and contrasted. Germene discoveries in physics (especially the work of Planck, Einstein, de Broglie, Heisenberg) and chemistry will be brought in.
Fall term
No prerequisite. 3 hours
(Not offered 1975-76)

206J* Special Problems in the Philosophy of Science
This course will take up various key topics with respect to the constitution and operation of the natural universe. Issues such as the definition of change, space and place, time, purpose in nature, the infinity of the universe, anti-matter, action-at-a-distance, etc. will be discussed.
Winter term
No prerequisite. 3 hours
(Not offered 1975-76)

210J* Philosophy of Man
What is man? What is man’s place among other creatures? How is the human race unified? Are there inferior races? Is man an accident of evolution? Is there any positive evidence to show otherwise? Are being free and being bound by the conditions of matter mutually exclusive? What are the major views on man as a species? How are love and sex aspects of man’s life? These are some of the questions this course will attempt to answer.
Winter term
No prerequisite. 3 hours

218J* 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.
Fall term
No prerequisite. 3 hours
Also offered in the Evening

219J* Practical Ethics
This course will discuss the applications of general ethics to the more specific areas of human endeavour. Among the topics discussed will be abortion, contraception, sex and marriage, obscenity, violence, drugs, egoism, dishonesty, various forms of human exploitation, genetic surgery, biological cloning and genetic pollution.
Winter term
No prerequisite. 3 hours
Also offered in the Evening

230J* 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.
Fall term
No prerequisite. 3 hours

237J* Ethics and Society
How does one achieve the good society? How can the results of ethical conclusions be applied to the laws of society? The course will concentrate on the various main alternatives open to someone interested in acting rationally with respect to his particular social situation, with an emphasis upon modern influences such as science.
Fall term
No prerequisite. 3 hours

260J* Issues in Higher Education
Why go to college? What are the present realities in education today in Canada? What is the future role of the liberal arts? The primary interest of the course will be upon what can be done in practice rather than upon ideal schemes.
Winter term
No prerequisite. 3 hours
(Not offered 1975-76)

300J* 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.
Fall term
Prerequisite: Second year standing. 3 hours

301J* The Western Philosophical Tradition (1600-Present)
A continuation of 300J*.
Winter term
Prerequisite: Second year standing. 300J* is not a necessary prerequisite. 3 hours
321J* Canadian Philosophy
This course aims at giving students an overview of the main philosophical influences on Canadian culture over the last two hundred years. It will concentrate mainly on the fundamental metaphysical views, and the various attempts at reconciling religion and science, of men such as T. McCulloch, J. Watson, J.C. Murray, G.S. Brett, E. Gilson, C. de Koninck, B. Lonergan, R.C. Lodge, and H.L. Stewart.
Fall and Winter terms
Prerequisite: One other course in philosophy or consent of instructor

333J Contemporary Philosophical Problems in Art
A discussion of some problems, especially in the areas of music, painting, and poetry, with which today's artist as well as his audience are confronted. Information Theory, computerized techniques, mass art, "Pop Art", the psychology of creative invention, art as an expression of reality, the morality of art, and art's function as a reflection of society are possible topics for discussion.
Year course
Prerequisite: One other philosophy course or consent of instructor. 3 hours (Not offered 1975-76)

349J Philosophy of Human Cognition
The problems of human knowledge have been in the foreground of philosophical discussions for three centuries. This course will cover such topics as the principles of all human knowledge, types and degrees of probability and certitude, Realism, and Idealism, the problem of universal predication, various meanings of truth, criteria of truth, and historiography.
Year course
Prerequisite: One other philosophy course or consent of instructor. 3 hours (Not offered 1975-76)

396J*-397J* Special Topics/Directed Readings
A series of readings and/or seminars on one or two topics or thinkers, with periodic reports and discussion.
Prerequisite: Consent of instructor

399J Tutorial
Students wishing to enrol in 399J should consult the College Department.

450J Being and Existence
An advanced course for the serious student, delving into the notions of reality, being, essence, existence, analogy, etc. The existence and nature of God as far as can be determined without any kind of revelation, will be examined. The techniques of linguistic analysis to be employed. Also, the very possibility of any kind of metaphysics will be discussed.
Year Course
Prerequisite: Third year standing or consent of instructor
Tutorial 1975-6

496J*-497J* Special Topics/Directed Readings
A series of readings and/or seminars on one or two topics or thinkers, with periodic reports and discussions.
Prerequisite: Consent of instructor

499J Tutorial and Honours Essay
Students wishing to enrol in 499J should consult the College Department.
Course Descriptions

Physics

Associate Professors
A. Anderson, M.A., D.Phil.(Oxon)
J.M. Corbett, B.A.Sc.(Toronto), M.Sc., Ph.D.
(Waterloo)
A.E. Dixon, B.Sc.(Mt. Allison), M.Sc.(Dalhousie),
Ph.D.(McMaster)
P.C. Eastman, B.Sc., M.Sc.(McMaster), Ph.D.(U.B.C.)
H.K. Ellenton, B.Sc.(Western), M.A.(Toronto)
M.P. Fitzgerald, B.Sc., M.Sc.(Toronto), Ph.D.(Case)
D. Hemmings, B.Sc., Ph.D.(Bristol)
J. Kruuv, B.A.Sc., M.Sc.(Waterloo), Ph.D.(Western)
J.D. Leslie, B.A.Sc.(Toronto), M.S., Ph.D.(Illinois)
C.C. Lim, B.A.(DePauw), M.A.(Nebraska), Ph.D.
(Toronto)
R.A. Moore, B.Sc., M.Sc.(McMaster), Ph.D.(Alberta)
H.M. Morrison, B.Sc., Ph.D.(Edinburgh)
R.K. Pathria, B.Sc., M.Sc.(Panjab), Ph.D.(Delhi)
M.M. Pintar, B.Sc., M.Sc., Ph.D.(Ljubljana)
A.D. Singh Nagi, B.A., B.Sc.(Panjab), Ph.D.(Delhi)
H.I.T. Smith, B.Sc., Ph.D.(London)
D.H. Torrie, B.A.Sc.(Toronto), Ph.D.(McMaster)
K.A. Woolner, B.Sc.(London)

Assistant Professors
J.K. Brandon, B.Sc., Ph.D.(McMaster), M.A.(Cantab.)
H.E. Frey, B.S., M.S., Ph.D.(Penn. State)
D.R. Rayburn, B.Sc.(Calagary), Ph.D.(Queen's)
J. Vanderkooy, B.Eng., Ph.D.(McMaster)

Faculty Computer Resource Person
D.L. Roberts, A.B.(Bowdoin College), Ph.D.(Case)

Senior Demonstrators
A.B. Haner, B.Sc., M.Sc.(Waterloo)
D.S. McVicar, B.Sc.(Waterloo)
L.J. Young, B.Sc.(Waterloo)

Faculty members holding cross appointments
as shown

1 Chemistry and Physics
2 Physics and Biology
Undergraduate Course Descriptions

Note 1
Details of the undergraduate programmes offered by the Faculty of Science are to be found in Chapter 15.

Note 2
All courses described are one-term courses unless otherwise designated. Such one-term courses are marked * and are 0.50 course credit unless otherwise specified.

Note 3
Prerequisites are given as a guide to the student and may be waived with the consent of the instructor.

001* Pre-University Physics
A pre-University or Remedial Physics course that covers the topics in Grades 11 to 13 which are considered essential for first year university physics courses. The course includes Kinematics, Dynamics, Energy, Momentum, Conservation Laws, Circular Motion, Gravitation, Vibrations and Waves, Heat and Temperature, Electricity, Light and Optics. Successful completion of this course fulfills the University admission requirements where high school Physics is necessary. Offered by correspondence only, one term.
No University Credit

11* Mechanics
3 lectures, 2 hours tutorial, Fall term

103* 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.
3 lectures, 3 hours laboratory alternate weeks, tutorials to be arranged

Note
Normally students who have completed Grade 13 Physics should select Physics 104* instead of 103*.

104* Mechanics in Human Movement
An introduction to the physical principles required for the analysis of mechanics of human movement.
A course for Kinesiology students.
Prerequisite: Grade 13 Physics
3 lectures, 3 hours laboratory alternate weeks, tutorials to be arranged

111* General Physics
3 lectures, and a tutorial period on alternate weeks, Fall term

111L* General Physics Laboratory 1
For students taking Physics 111*.
3 hours laboratory on alternate weeks, 0.25 course credit, Fall term

112* General Physics
Electric fields and potential, D.C. circuits, magnetic fields, A.C. generators and circuits, elementary electronics. The thin lens equations, diffraction, resolution of optical instruments, the eye; camera, telescope and microscope. Coherent light, colour, polarization, birefringence and photometry.
3 lectures, and a tutorial period on alternate weeks, Winter term

112L* General Physics Laboratory 2
For students taking Physics 112*.
3 hours laboratory on alternate weeks, 0.25 course credit, Winter term

Note
The one-year sequence Physics 111*-112* is primarily intended for students who plan to proceed in Biology, Biology and Chemistry, or Earth Sciences. Physics 111L*-112L* is recommended for students who plan to proceed in the Optometry programme and for those students who want some practical laboratory experience to complement their theoretical studies or to fulfill entrance requirements of certain medical or dental schools.

121* Introductory Physics 1
Introduction to mechanics, including special relativity, motion of particles, conservation of energy and momentum, fluid statics and dynamics, rotational kinematics.
Prerequisite: Grade 13 Mathematics – Functions and Relations, Calculus. Grade 13 Physics recommended
3 lectures, and a tutorial period on alternate weeks, Fall term
Science students must take 121L* with this course

121L* Introductory Physics 1 Laboratory
For students taking Physics 121*.
3 hours laboratory on alternate weeks, 0.25 course credit, Fall term
122* Introductory Physics 2
This course is a continuation of Physics 121*.
Rotational dynamics, vibrations, waves, gravitation, heat and thermodynamics, properties of materials.
Prerequisite: Physics 121*.
3 lectures, and a tutorial period on alternate weeks, Winter and Spring terms. Science students must take 122L* with this course

122L* Introductory Physics 2 Laboratory
For students taking Physics 122*.
3 hours laboratory on alternate weeks, 0.25 course credit, Winter and Spring terms

Note
The one-year sequence Physics 121*-122* is primarily intended for students who plan to proceed in Physics and in Mathematics.

162* Introductory Physics A
Introduction to Newtonian mechanics including gravitation, collisions and conservation laws, conservative forces and motion under central forces.
Prerequisites: At least 75% average in Grade 13 Physics, Mathematics – Functions and Relations, and Calculus
3 lectures, and a tutorial period on alternate weeks, Fall term
Science students must take 162L* with this course

162L* Introductory Physics A Laboratory
For students taking Physics 162*.
3 hours laboratory on alternate weeks, 0.25 course credit, Fall term

163* Introductory Physics B
This course is a continuation of Physics 162*. Rotational dynamics, vibrations of physical systems, resonance, coupled oscillators and normal modes, waves and interference.
Prerequisite: Physics 162*
Science students must take 163L* with this course.
Cooperative students wishing to take this sequence must have their 1B term in the Winter
3 lectures, and a tutorial period on alternate weeks, Winter term

163L* Introductory Physics B Laboratory
For students taking Physics 163*.
3 hours laboratory on alternate weeks, 0.25 course credit, Winter term

Note
The one-year sequence Physics 162*-163* is an enriched version of the Physics 121*-122* sequence intended for students registered in the Year 1 Science programme or the Year 1 Mathematics programme.

222* Electricity and Magnetism 1
Coulomb’s law, electric field, Gauss’s law, potential, capacitance, properties of dielectrics, current, resistance, electromotive force, D.C. circuits and instruments.
Prerequisites: A course in first year physics and in calculus or consent of instructor
2 lectures, 1 hour tutorial, Fall term
Physics Majors must take 222L* with this course

222L* Electricity and Magnetism 1 Laboratory
For students taking Physics 222*.
3 hours alternate weeks, 0.25 course credit, Fall term

223* Electricity and Magnetism 2
Magnetic fields, induced electromotive forces, magnetic properties of matter, alternating currents, electromagnetic waves.
Prerequisite: Physics 222*
2 lectures, 1 hour tutorial, Winter and Spring terms
Physics Majors must take 223L* with this course

223L* Electricity and Magnetism 2 Laboratory
For students taking Physics 223*.
3 hours alternate weeks, 0.25 course credit, Winter and Spring terms

226* Optics 1
Reflection and refraction at plane and curved surfaces, thin and thick lenses, optical instruments. Reading assignments on various topics in modern optics.
Prerequisites: A course in first year physics and in calculus or consent of instructor
2 lectures, Fall term
Physics Majors must take Physics 226L* with this course

226L* Optics 1 Laboratory
For students taking Physics 226*.
3 hours alternate weeks, 0.25 course credit, Fall term

227* Optics 2
The wave nature of light, interference, diffraction, slits and gratings, resolution, polarization, photometry. Reading assignments on lasers and the uses and properties of laser light.
Prerequisite: Physics 226*
2 lectures, Winter term
Physics Majors must take Physics 227L* with this course

227L* Optics 2 Laboratory
For students taking Physics 227*.
3 hours alternate weeks, 0.25 course credit, Winter term
243* Electricity and Magnetism
Electrostatics, D.C. circuits, magnetic fields, electromagnetic induction, A.C. circuits, electrical measurements.
Prerequisite: A course in first year physics and in calculus or consent of instructor
3 lectures, 3 hour laboratory alternate weeks, Offered in Fall, Winter and Spring terms

243L* Electricity and Magnetism Laboratory
For students taking Physics 243*.
3 hours alternate weeks, 0.25 course credit, offered in Fall, Winter and Spring terms

244 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. Kinetic theory, basic statistical mechanics, Boltzmann distribution, elementary X-ray diffraction.
(Not for General Students)
2 lectures, for 2 terms

246* Physical Optics
Prerequisites: A course in first year physics and in calculus or consent of instructor. Corequisite: Physics 246L*
This course is primarily intended for students registered in the Optometry programme
3 lectures, 1 hour tutorial, Winter term

246L* Physical Optics Laboratory
For students taking Physics 246*.
3 hours alternate weeks, 0.25 course credit, Winter term

250* 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. Astronomical coordinate systems, gravitational astronomy, astronomical measurements and instruments, physical nature of the planets, satellites, etc. which comprise the solar system.
Prerequisites: First year courses in physics and mathematics, or consent of instructor
3 lectures, Fall term

251* 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. The Sun, a typical star, observational methods and interpretation in stellar astronomy, structure of stars, distribution and motion of stars, structure of the Milky Way galaxy, external galaxies, cosmology.
Prerequisites: First year courses in physics and mathematics, or consent of instructor
3 lectures, offered in Winter and Spring terms

252* Electricity and Magnetism 1
Coulomb's Law, electric fields, Gauss' theorem, divergence theorem, potential, capacitance, dielectric theory, resistivity, DC circuits, transient currents, AC circuits, measuring instruments.
Physics Majors must take Physics 252L* with this course
Prerequisites: A course in first year Physics and in Calculus or consent of instructor
2 lectures, 1 hour problems, Fall term
Recommended for students in Honours Programmes
This course is a good basis for the understanding of practical circuits and of electrostatic forces in matter

252L* Electricity and Magnetism 1 Laboratory
For students taking Physics 252*.
3 hours alternate weeks, 0.25 course credit, Fall term

253* Electricity and Magnetism 2
Magnetic Fields, Ampere's Law, Induced electromotive forces, magnetic properties of materials, magnetic devices, displacement currents, Maxwell's equations, electromagnetic waves.
Physics Majors must take Physics 253L* with this course
Prerequisites: Physics 252*, Mathematics 31*
2 lectures, 1 hour problems, offered in Winter and Spring terms
Recommended for students registered in Honours programmes
This course, with Physics 252*, forms a basis for the understanding of most of today's electronic and electrical technology

253L* Electricity and Magnetism 2 Laboratory
For students taking Physics 253*.
3 hours, alternate weeks, 0.25 course credit, offered in Winter and Spring terms
255* 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.
Prerequisites: A course in first year physics and in calculus or consent of instructor
3 lectures, offered in Winter and Spring terms
Recommended for students registered in Honours programmes

256* Optics
Reflection and refraction at plane and curved surfaces using the matrix method, thin and thick lenses, optical instruments. The wave nature of light, interference, diffraction, slits and gratings, resolution. Polarization, optical activity, photometry.
Prerequisites: A course in first year physics and in calculus or consent of instructor
3 lectures, offered in Fall term
Physics Majors must take Physics 256L* with this course
Recommended for students registered in Honours programmes

256L* Optics Laboratory
For students taking Physics 256*. 3 hours, alternate weeks, 0.25 course credit, offered in Fall term

259* Crystallography and X-Ray Diffraction
An introduction to solid state physics from a structural point of view. 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.
Prerequisites: A course in first year physics and in calculus or consent of instructor
Corequisite: Physics 259L*
3 lectures, Winter and Spring terms

259L* Crystallography and X-Ray Diffraction Laboratory
For students taking Physics 259*. 3 hours, alternate weeks, 0.25 course credit, offered in Winter and Spring terms

265* Introduction to Mathematical Physics
Some mathematical techniques used in solving problems in the areas of physics familiar to second-year students i.e. mechanics, thermodynamics and electromagnetism. The use of differential equations, partial derivatives, vectors, polar coordinates and matrices. Elementary statistics for the analysis of experimental data.
Prerequisites: A course in first year physics and in calculus or consent of instructor
3 lectures, offered in Fall, Winter and Spring terms

270* Laboratory
Further experiments in optics for students taking Physics 256L*.
3 hours, alternate weeks, offered in Fall term, 0.25 course credit

271* Laboratory
Further experiments in electricity and magnetism for students taking Physics 253L*.
3 hours, alternate weeks, offered in Winter and Spring terms, 0.25 course credit

301* Physical Instrumentation for Biologists 1
Ultra-centrifugation, spectroscopy, microscopy, use of radioactive tracers.
Prerequisites: A course in first year physics and in calculus or consent of instructor
2 lectures, Fall term

302* Physical Instrumentation for Biologists 2
Detection and measurement of ionizing radiation, read-out devices, transducers and other techniques.
Prerequisite: Physics 301*, or consent of instructor
2 lectures, Winter term

324* Atomic and Nuclear Physics 1
Fundamentals of modern physics, special theory of relativity, quantization of electromagnetic radiation, wave properties of particles, the hydrogen atom.
Prerequisites: Physics 222*, 223*, 226* and 227*, or consent of instructor
3 lectures, offered in Fall term
Recommended for students registered in General programmes

325* Atomic and Nuclear Physics 2
Many electron atoms, atomic and X-ray spectra, nuclear structure, nuclear reactions, molecular and solid state physics.
Prerequisite: Physics 324*
3 lectures, Winter term
Recommended for students registered in General programmes
350* Astrophysics 1
Prerequisites: none, however, familiarity with the contents of Physics 250*-25J* will be assumed.
3 lectures, offered in the Fall term of odd-numbered years to third and fourth year students.

351* Astrophysics 2
Prerequisites: none, however, familiarity with the contents of Physics 250*-25J* will be assumed.
3 lectures, offered in the Winter and Spring of even-numbered years to third and fourth year students.

Note
Physics 450*, Astrophysics 3, and Physics 451*, Astrophysics 4, are also open to third and fourth year students. Physics 350* alternates with Physics 450* and Physics 351* alternates with Physics 451*.

352* Electronics 1
Basic A.C. circuit theory. A survey of tubes, transistors and solid state devices, equivalent circuits, power supplies, amplifiers and feedback.
Prerequisites: Physics 222*-223* or equivalent and Mathematics 31*
Corequisite: Physics 352L*
3 lectures, offered in Fall and Spring terms and if sufficient demand in the Winter term.

352L* Electronics 1 Laboratory
For students taking Physics 352*.
3 hours, alternate weeks, 0.25 course credit, offered in the same terms as Physics 352*.

353* Electronics 2
Applications of feedback to oscillators, operational amplifiers, analogue computers and multi vibrators. Introduction to pulse techniques, FM and TV circuits.
Prerequisite: Physics 352*
Corequisite: Physics 353L*
2 lectures, Winter term.

353L* Electronics 2 Laboratory
For students taking Physics 353*.
3 hours, alternate weeks, 0.25 course credit, offered in Winter term.

354* 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.
Prerequisite: Physics 255*
2 lectures, offered in Fall and Spring terms.

355* Nuclear and Particle Physics
Nuclear structure, interactions of nuclear radiations with matter, radioactive decay, nuclear reactions, nuclear force, elementary particles.
Prerequisite: Physics 255*
3 lectures, Winter term.

358* Thermodynamics
Thermodynamic systems, equation of state, the laws of thermodynamics with applications. Change of phase.
Prerequisites: Mathematics 237 and a first year Physics course.
3 lectures, offered in Fall and Spring terms.

359* Statistical Mechanics
Prerequisite: Physics 358*
3 lectures, Winter term.

360A* Intermediate Laboratory
Selected experiments in mechanics, atomic physics, solid state physics, optics and electronics.
18 hours of experiments, offered in Fall and Spring terms.
0.25 course credit.

360B* Intermediate Laboratory
Continuation of 360A*.
18 hours of experiments, offered in Winter term.
0.25 course credit.

362* Classical Mechanics 1
Prerequisites: A first year Physics course, Mathematics 130, 237 and 31*
3 lectures, offered in Fall and Spring terms.

363* Classical Mechanics 2
Prerequisite: Physics 362* or Mathematics 234
3 lectures, Winter term.
Course Descriptions
Physics

364* Mathematical Physics 1
Vector and tensor analysis with applications.
Prerequisites: Mathematics 237 and 31*
3 lectures, offered in Fall and Spring terms

365* Mathematical Physics 2
Prerequisites: Mathematics 237 and 31*
3 lectures, Winter term

368* 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 Sciences 368*).
Prerequisite: A course in first year Physics and in calculus or consent of instructor
2 lectures, Fall term

369* 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. Copiolis effects. Some idealized current regimes. (Identical to Earth Sciences 369*).
Prerequisite: Physics 368* or consent of instructor
2 lectures, Winter term

371A* Intermediate Laboratory
Further experiments in atomic, nuclear and solid state physics, optics and electronics. For honours students who are taking Physics 360A*.
18 hours of experiments, offered in Fall and Spring terms
0.25 course credit

371B* Intermediate Laboratory
Continuation of 371A*.
For honours students who are taking Physics 360B*.
18 hours of experiments, offered in Winter term
0.25 course credit

380* Molecular Biophysics
Energy production, transport and release in cells, structure of large molecules and their replication, genetic code, control of intracellular processes.
Prerequisites: First year Chemistry, Mathematics 31*, Physics 252* and 253* or consent of instructor
3 lectures, Fall term

381* Cell Biophysics
Structure and behaviour of cell membranes, diffusion problems, selective ion transport, electrical activity and nerve conduction, cilia and flagella, muscle cells, sensory receptor cells, synthesis of cell components and cell division.
Prerequisite: Physics 380*
3 lectures, Winter term

431* Classical Mechanics 3
Review of Lagrangian formulation, Hamiltonian formulation, variational principles, canonical transformations, Hamilton-Jacobi theory, Poisson brackets, application to continuous media, relativistic mechanics, classical theory of fields.
Prerequisites: Physics 362*, 363*, 364* and 365*
3 lectures, Fall term

432* 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.
Prerequisite: Physics 435*
3 lectures, Winter term

433 Experimental Research Project
An experimental research project. This course is designed for students in the Honours Physics Programme and in the Cooperative Applied Physics Programme.
It is strongly recommended that Students in these programmes take either Physics 433 or Physics 437*. Enrolment may be limited. Two terms, Fall and Winter, 1.00 course credits

434A* Introductory Quantum Mechanics
Prerequisite: Physics 354*
2 lectures and 1 tutorial hour, Fall term
434B* Quantum Mechanics
Prerequisite: Physics 434A*
2 lectures and 1 tutorial hour, Winter term

Note
Physics 434B* is strongly recommended for students intending to do graduate work.

435* 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.
Prerequisite: Physics 255* or equivalent
3 lectures, Fall term

437* Theoretical Physics Project
Selected subjects for advanced study by theoretically inclined students, topics in relativistic, quantum, and statistical physics.
It is strongly recommended that students in the Honours Physics Programme or the Co-operative Applied Physics Programme take either Physics 433 or Physics 437*
Enrolment may be limited, 3 hours per week, Winter term

438 Geophysics 3
A more advanced discussion of seismology and the internal constitution of the Earth, mechanical properties of the Earth's interior, figure of the Earth and its gravitational field, temperature and thermal history of the Earth, internal magnetic field of the Earth and its electrical properties at depth, the rotation of the Earth and its geophysical effects.
2 lectures for two terms, Fall and Winter
Not offered every year

441 Electromagnetic Theory
A generalized treatment of the basic laws of electricity and magnetism, mathematical techniques for the problems of electrostatics, solution of Maxwell's equation in free space and the study of plane waves, theory of waveguides and introduction to radiation.
Prerequisites: Physics 222* or 223* or Physics 222* or 253*, Physics 364* or 365* or equivalent
2 lectures and 1 hour tutorial for two terms, Fall and Winter

442* 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.
Prerequisite: Physics 435*
3 lectures, Winter term

443* Classical Field Theory
An introduction with applications in the areas of elasticity and hydrodynamics. (The electromagnetic field is discussed in Physics 441). Topics covered are the conservation laws, field equations, boundary conditions. Equations of state, invariance, material symmetry. Methods of solution, application to fluid and elastic systems with simple geometries.
Prerequisites: Physics 364*-365* or equivalent
3 lectures, Winter term

444* Nuclear Physics
Elements of nuclear structure and systematics. Alpha emission, beta decay, gamma emission, two-body systems and nuclear forces, nuclear reactions. Neutron physics. Sub-nuclear particles.
Prerequisite: Physics 355*
3 lectures, Winter term

445* Modern Optics
Prerequisites: Physics 256*, Physics 354*
3 lectures, Fall term

449* 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.
Prerequisites: Physics 223* or 253* and 250*-251*
3 lectures, offered in the Fall term of even-numbered years to third and fourth year students
450* Astrophysics 3
Solar system astrophysics. The application of the observational and theoretical techniques of physics to the study of the solar system (excluding the sun). The physical nature of planetary (and satellite) surfaces, atmosphere and interiors. Asteroids, meteors and comets. The interplanetary medium (solar wind), Solar interactions with the interplanetary medium and the earth's magnetosphere.
Prerequisites: none, however, familiarity with the contents of Physics 250*-251* will be assumed
3 lectures, offered in the Fall term of even-numbered years to third and fourth year students.

451* Astrophysics 4
The structure of stellar interiors, nuclear reaction and energy sources in the stars of the main sequence, early evolution of stars from the main sequence. Lifetimes of the stars.
Prerequisites: none, however, familiarity with the contents of Physics 250*-251* will be assumed
3 lectures, offered in the Winter and Spring terms of odd-numbered years to third and fourth year students

452* Digital Electronics
Fundamentals and advanced concepts of digital logic stressing practical uses of modern integrated circuit technology.
Prerequisites: Physics 352*-353*
2 lectures, a total of 18 hours of experiments, Fall term

453* Analogue Circuits
A variety of topics in the operation of systems. Transistors, modern circuit techniques, noise, stability under feedback, information theory, and possible student motivated topics. Includes laboratory demonstrations.
Prerequisites: Physics 352*-353*
3 lectures, Winter term

464* Mathematical Physics 3
Applications to Physics of the theory of functions of a complex variable.
Prerequisites: Physics 364*-365*
2 lectures and 1 tutorial hour, Fall term

465* Mathematical Physics 4
Theory and applications of integral transforms (Fourier, Laplace), integral equations and Green's functions.
Prerequisite: Physics 464*
2 lectures and 1 tutorial hour, Winter term

480* Radiation Biophysics
The effect of radiation of various kinds on cells and tissues, exposure calculations, mechanism of damage, repair theories, genetic effects, target theory, isotopic tracers in biophysical research.
Prerequisites: Physics 222*-223* and Mathematics 236 or equivalent, or consent of instructor
3 lectures, Fall term

481* Biophysics of Organ Systems
Physics of homeostasis, interactions with the environment, circulation of blood, temperature regulation, respiration, transport problems and special organ systems.
Prerequisites: Physics 222*-223* and Mathematics 236 or equivalent, or consent of instructor
3 lectures, Winter term

482* Biophysics of Nervous Systems
Neurons; nerve conduction, sensory transducers; coding, processing and storage of information; control of muscles and other effector organs.
Prerequisites: Physics 252* and Mathematics 31*, or equivalent or consent of instructor
3 lectures, Fall term
Recommended for third or fourth year students in Mathematics, Engineering or Science

Course Descriptions
Physics
Department of Political Science

Associate Professor, Chairman of the Department
J.M. Wilson, B.A., M.A.(Toronto)

Professors
J.E. Kersell, B.A., M.A.(Queen's), Ph.D.(London)
T.H. Qualter, B.A.(New Zealand), Ph.D.(London)

Associate Professors
C.H. Grant, B.A., M.A.(Leicester), Ph.D.(Edinburgh)
A.D. Nelson, A.B., A.M., Ph.D.(Chicago)

Assistant Professors
J.D. Fraser, B.A.(Cantab.), Ph.D.(Leicester)
A. Kapur, B.A.(Panjab), M.A.(George Washington), Ph.D.(Carleton)
R.J. Williams, B.A., M.A.(McMaster), Ph.D.(Toronto)
R.P. Woolstencroft, B.A.(Alberta)

Lecturers
F. Miller, B.A.(U.B.C.), M.Phil.(Yale)
W.B. Moul, B.A., M.A.(U.B.C.)
J.E. Surich, B.A., M.A.(Waterloo)

Undergraduate Programmes

While students in Arts do not choose a major until the end of their 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 their first year courses. The Department would recommend the following programme for such students:

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

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

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

1 - methodology
2 - normative theory
3 - public administration, public law, and public policy
4 - local and regional politics
5 - comparative politics (more than one country)
6 - comparative politics (specific countries)
7 - the political process
8 - international politics

with the number 9 reserved for special courses which are not regarded as dealing with a particular field of the discipline.

1 General Programme
Students choosing a three-year General programme in Political Science (see the University's requirements for the General Programme in Chapter 8) will normally complete, before graduation, the equivalent of five full courses in Political Science beyond the 100 level, of which there must be at least one-half course from each of four different fields of the discipline as defined above.
2 Honours Programme
Students choosing an Honours programme in Political Science (see Chapter 8) must complete, before graduation, the equivalent of nine full courses in Political Science beyond the 100 level, of which four must be from different fields of the discipline as defined above. Honours students may elect to pursue a series of connected courses as a minor programme in a related discipline such as Anthropology, Economics, Geography, History, Philosophy, or Sociology in consultation with the departments involved.

3 Joint Honours Programme
Students who wish to combine a study of Political Sciences with a broad training in a related discipline such as Sociology or History, or in fact in any other discipline in which they are interested, can do so in a joint honours programme.

It is possible to combine the Political Science joint honours requirements (see Chapter 8) with the requirements made by Anthropology, Economics, English, French, Geography, History, Man-Environment, Philosophy, Psychology or Sociology. In a joint honours programme involving a Department in another Faculty, as in the Political Science and Man-Environment programme, students will fulfill the degree requirements of the Faculty in which they are registered. For a joint honours programme in any other discipline, please consult the Political Science Department and the other department concerned.

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

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

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

Graduate Programme
The Department of Political Science offers a programme leading to the degree of Master of Arts. The programme consists of the equivalent of two full courses and a thesis, or the equivalent of three full courses and a cognate essay. Highly personalized, flexible instruction is also offered in the form of reading courses. The equivalent of four full courses will be offered in 1975-76. These are in Canadian Politics, Political Theory, Comparative Politics, and International Relations. For more information, please consult the Graduate Calendar or the Political Science Department.

Undergraduate Course Descriptions

Note
Extensive descriptions of the content of Political Science courses are available in the Department at the time of pre-registration.

101* Introduction to Politics 1
An introduction to the conflict of political ideas in modern industrial society, based on a discussion of Liberalism, Conservatism, Marxism and Socialism, and their relationship to the individual and democracy. Fall term

102* Introduction to Politics 2
A study of selected aspects of government and politics. Normally taught in several sections, each of which deals with one theme. Prerequisite: Political Science 101*, or consent of instructor. Winter term

Note
In 1974-75 this course was offered in five sections. Students were able to enroll in one of "The Parliamentary Tradition", "The Political Process in Modern Political Systems", "Imperialism in International Relations", "Politics in Action" or "Politics and Global Ecology". A similar set of courses will be announced during the Fall term of 1975-76.
214* Quantitative Analysis
An introduction to the use of quantitative methods in Political Science. Only a rudimentary understanding of mathematics is required.
Open only to Political Science majors
Winter term

221* The History of Political Theory 1: The Classical Period
The first part of a history of the development of western political theory from the time of Socrates to the present day. An examination in depth of a few political theories of central importance in the emergence of modern political theory from its ancient origins.
No prerequisite for students in the second year and above
Fall term

222* The History of Political Theory 2: The Modern Period
The second part of a history of the development of western political theory from the time of Socrates to the present day. An examination in depth of a few political theories of central importance in the emergence of modern political theory from its ancient origins.
No prerequisite for students in the second year and above
Winter term

225* Political Theory 1
A survey of the principal ideas of the leading political thinkers in the development of western political theory from the earliest times to the seventeenth century, based on an examination of their implicit and explicit assumptions about the nature of the different societies in which they lived.
No prerequisite for students in the second year and above
Fall term

226* Political Theory 2
A survey of the principal ideas of the leading political thinkers in the development of western political theory from the seventeenth century to the present, based on an examination of their implicit or explicit assumptions about the nature of the different societies in which they lived.
No prerequisite for students in the second year and above
Winter term

232* Policy-Making in Canada
The purpose of this lecture course is to show how the various components of the Canadian political system contribute to policy decisions at the federal level. Part of the class time will be devoted to conducting a simulated policy process (a political game).
No prerequisite for students in the second year and above
Winter term

251* Comparative Politics 1
A survey of the principal historical and contemporary forces shaping politics in Western Europe with a view to evaluating who gets what, when and how, against whom the game is stacked and what potential exists for change. Specific focus on Britain, France, Germany and Italy.
No prerequisite for students in the second year and above
Fall term

252* Comparative Politics 2
A continuation of Political Science 251* with a narrowing of the theoretical focus to a specific concern with cleavage structures and conflict and a broadening of the empirical scope to take account of significant experiences of smaller nations such as Austria and non-European nations such as Chile.
Prerequisite: Political Science 251*
Winter term

260 Canadian Government and Politics
An analysis of the structure of the Canadian political system dealing with such questions as the role of Quebec, federal-provincial differences, the nature of cabinet composition, and Canadian voting behaviour. (Students in co-operative programmes may take either or both halves of this course as 260A in the Fall and Spring terms and 260B in the Winter term). No prerequisite for students in the second year and above
Year

262* Soviet Government and Politics
A survey of the development of Soviet political structures with analysis of the relative influence of ideological goals on the one hand and social forces on the other.
No prerequisite for students in the second year and above
Winter term
**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 prerequisite for students in the second year and above*
*Winter term*

**British Government and Politics**
An examination of the uniquely British characteristics of the British political system. 
*No prerequisite for students in the second year and above*
*Winter term*

**International Politics 1**
Sovereignty and interdependence. The concept of the International System. Political change in the contemporary world. 
*No prerequisite for students in the second year and above*
*Fall term*

**International Politics 2**
Development of the concept of system especially with reference to conditions and patterns of international politics. 
*Prerequisite: Political Science 281* or consent of instructor
*Winter term*

**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*
*Fall term*

**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. Legal precedents and perspectives on such questions as the protection of civil liberties in Canada, censorship, abortion, labour relations, and others will be examined. Taught by a member of the legal profession. 
*Prerequisite: Political Science 291* or consent of instructor
*Winter term*

**Methodology of Political Science: The Foundations**
A selective examination of seminal works which have contributed to modern scientific methods of studying politics. The primary focus of interest will be on methodological considerations of major contributors, ranging in time from Bacon and Hobbes to such recent and contemporary writers as Weber, Mannheim, and Kuhn. It is not a survey course. 
*Prerequisite: Consent of the instructor*
*Fall term*
*Alternates with Political Science 327*

**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*
*Fall term*

**Marxism and Revolution After Marx**
A selective study of developments in Marxist theory and political movements after Marx. 
*Prerequisite: Political Science 321*
*Winter term*

**Ancient Political Philosophy**
A selective examination of political philosophy during the classical period in Greece. 
*Prerequisite: Consent of the instructor*
*Fall term*

**Modern Political Philosophy**
A selective examination of political philosophy in the modern period. 
*Prerequisite: Consent of instructor*
*Winter term*

**Political Science and Political Values**
An examination of the relationship of "values" to a proper science of politics. 
*Prerequisite: Consent of instructor*
*Alternates with Political Science 311*
*Fall term*
*Not offered 1975-76*

**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. 
*Prerequisite: Political Science 260 or consent of instructor*
*Fall term*
332* Public Administration 2
Analyses of problems and issues in the field applying the knowledge gained in Political Science 331*.
Prerequisite: Political Science 331* or consent of instructor
Winter term

341* 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.
Prerequisite: Political Science 260
Fall term

343* Urban Politics 1
This course deals with structural responses to the process of urbanization, with special reference to metropolitan and regional form of government in Canada.
Open to students in the third year and above with at least one previous course in Political Science
Fall term

344* Urban Politics 2
This course deals with the study of community power, leadership, and the decision-making process.
Prerequisite: Political Science 343* or consent of instructor
Winter term

350 The Politics of the Developing Areas
An examination of selected topics in the politics of developing societies. Emphasis will be placed upon the theoretical and empiric adequacy of particular explanations of both macro and micro political and economic change in Asian, African and Latin American states. These theoretical concerns rather than a specific geographical area will receive attention.
No prerequisites for students in third year and above Year

365* Studies in Soviet Politics
Selected topics in the theory and practice of Soviet politics, with some discussion of comparative Communist studies.
Prerequisite: Political Science 262*
Fall term

370 Political Behaviour
An intensive and critical examination of the impact of behaviouralism upon the study of politics, focusing on the methodological assumptions and aspirations of behaviouralism, and models of description and explanation held to be valid in political studies. An examination of substantive studies at both the micro and macro levels forms the second part of the course.
Prerequisite: At least one previous course in Political Science
Year

371* Political Culture
An analysis of the development of the concept of political culture as an analytical tool.
Prerequisite: Political Science 251*
Fall term

372* The Political System
An examination of the concept of system as applied to the study of politics.
Prerequisite: Consent of instructor
Winter term

373* Political Parties
An examination of the relationship of political parties and party systems to the dynamics of social change taking into account the imperatives of survival and adaptation and the dilemma of principles versus power.
Prerequisite: At least one of Political Science 251*, 252*, 260, 264*, 262* or 268*
Fall term

374* Interest Group Politics
A study of interest group theory and comparative analysis of the internal politics of interest groups and their role in the political process.
Prerequisite: At least one of Political Science 251*, 252*, 260, 264*, 262* or 268*
Winter term

377* Political Socialization
A study of the processes and agents of political socialization and their effect on political stability or change in liberal-democratic societies.
Prerequisite: Consent of the instructor
Fall term
380 World Politics
An examination of the structure or institutional arrangements of global society and their inter-relationships with interstate war and the allocation of misery. A wide range of theories of international violence and imperialism will be considered. The emphasis will not be upon current events but upon trends in the relationships between states since 1815 to the present and "pushing" these trends into the future.
Open only to students in the third year and above

390-398* 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.

411* Theories and Methods of Political Science
An examination of selected topics in political science research such as measurement, causal analysis and experimentation. Particular emphasis will be placed upon the influence of science and scientific activity which are common in political science and are problematic in the history and philosophy of social science.
Prerequisite: Consent of the instructor
Fall term

424* Contemporary Socialist and Communist Thought
This course examines recent trends in Marxist theory and its contribution to the analysis of capitalist and socialist societies.
Prerequisite: Consent of the instructor
Winter term

426* 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 prerequisites Political Science 221*, 222*, 323* or 324*, or consent of instructor
Winter term

427* Special Topics in Political Philosophy
A selective examination of basic problems in political philosophy in the modern and pre-modern periods.
Prerequisite: Political Science 221*, 222*, 323* or 324*
Fall term

428* State and Economic Life
An analytical and comparative study of the growth of government intervention in the economic process, and of the development of the welfare state.
Prerequisite: Consent of the instructor
Winter term

431* Canadian Public Policy 1
An examination of the policy initiatives as taken, for example, by the cabinet and the bureaucracy itself; how policy initiatives and related information are processed at the federal level by departments, the Privy Council Office, cabinet committees, etc.
Prerequisite: Political Science 260 or 331*/332* or consent of instructor
Fall term

432* Canadian Public Policy 2
A study of the internal controls and external influences on the federal bureaucracy in its role of policy implementation.
Prerequisite: Political Science 431* or consent of instructor
Winter term

434* Canadian Foreign Policy
A seminar devoted to the courses, factors and challenges of Canadian foreign policy. Some attention will be paid to how policy is made. The general patterns may, if students wish, be illustrated by case studies of major contemporary issues.
Prerequisite: Consent of the instructor
Winter term

442* Politics in Ontario
A critical examination of the distinctive elements of government and politics in the Province of Ontario. 
Prerequisite: Political Science 260 or 341* or consent of instructor
Winter term

443* 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.
Prerequisite: Political Science 260 or 341* or consent of instructor
Fall term
Alternates with Political Science 445*; not offered in 1975-76

444* Politics in Quebec
A sympathetic look at Quebec, its nationhood, its contradictions, its struggles and its political life.
Prerequisite: Political Science 260 or 341* or consent of instructor
Winter term
445* 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.
Prerequisite: Political Science 341*
Fall term
Alternates with Political Science 443*

451* Comparative Parliamentary Systems
An analytical comparison of parliamentary institutions and processes as they have developed in various political systems influenced by Britain.
Prerequisite: Political Science 251* or consent of instructor
Fall term

458* The Third World
This course deals with the Third World primarily in the international context. As the problems of this group of countries are on a large scale and very diverse, they will be examined on a comparative basis.
Prerequisite: Political Science 350 or consent of instructor
Winter term

461* Problems in Canadian Politics 1
A critical examination of various problems of Canadian politics, with an emphasis on political integration, federalism and political parties.
Prerequisite: Consent of the instructor
Fall term

462* 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 prerequisite Political Science 461*
Winter term

471* Public Opinion and Propaganda
A detailed study of the nature of public opinion and the attempt to control it through propaganda.
Prerequisite: Consent of the instructor
Fall term

473* Voting Behaviour
Prerequisite: Political Science 214* or 373* or consent of instructor
Fall term

478* Research Seminar in Political Socialization
This course is designed to follow the introductory work undertaken in Political Science 377* and will focus on the content of the socialization process, particularly in liberal-democratic societies.
Prerequisite: Political Science 377*
Winter term

485* International Politics of Asia
This course examines the emergence of Asia in world politics after 1945. It defines the international power structure of Asia, its political and military settings and the relationship between ideological and security issues. It makes a comparison between the techniques of gaining influence through alliance politics and non-alignment politics. The role of the superpowers is assessed in relation to the behaviour of some of the middle and small powers in the Asian international system.
Prerequisite: Consent of the instructor
Winter term

490*-498* 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.

499 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
R.K. Banks, B.A., M.A., Ph.D.(Toronto)

Professor, Associate Chairman Graduate Affairs
M.P. Bryden, B.S.(McGill), M.Sc., Ph.D.(McGill)

Associate Professor, Associate Chairman
Undergraduate Affairs
G.A. Griffin, B.A.(McMaster), M.A., Ph.D.(Wisconsin)

Professor, Associate Dean, Graduate Affairs
M.D. Vogel-Sprott, B.A.(McMaster), M.A., Ph.D.(Toronto)

Professors
K.S. Bowers, B.A., Ph.D.(Illinois)
J.M. Butler, B.S., Ph.D.(Minnesota)
W.C. Corning, B.A.(Heidelberg), Ph.D.(Rochester)
D.P. Crowne, B.A.(Antioch College), Ed.M.(Rochester), Ph.D.(Purdue)
J.A. Dyal, B.A.(Antioch College), Ph.D.(Illinois)
W.D. Fenz, B.A.(Southern Missionary), M.A., B.D.(St. Andrew's), M.Sc.(Hawaii), Ph.D.(Massachusetts)
H.M. Lefcourt, B.A.(Antioch), M.A., Ph.D.(Ohio State)
M. Lerner, B.A., M.A.(Ohio State University), Ph.D. (New York University)
D. Meichenbaum, A.B.(City College of New York), M.A., Ph.D.(Illinois)
S. Reinis, M.D., C.Sc.(Charles University)
S.D. Saleh, B.A.(Cairo), M.A., Ph.D.(Case Western Reserve)
D.A. Sprott, B.A., M.A., Ph.D.(Toronto), F.S.S.

Associate Professors
D.M. Amoroso, B.A., M.A.(Toronto), Ph.D.(Waterloo)
M. Breidenbaugh (Mrs.), B.A.(Wittenberg), Ph.D.(Vienna)
T.E. Cadell, B.A.(British Columbia), M.A.(Massachusetts), Ph.D.(Wisconsin)
J.A. Cheyne, B.A.(Waterloo Lutheran), M.A., Ph.D.(Waterloo)
J.M. Cornell, B.A., M.S., Ph.D.(Washington)
C.H. Lay, B.A.(New Brunswick), M.A., Ph.D.(Western Ontario) (visiting)
G.E. MacKinnon, B.A.(Queen's), Ph.D.(John Hopkins)
P.M. Merikle, B.A.(Knox), M.A., Ph.D.(Virginia)
R.R. Ross, B.A., M.A., Ph.D.(Toronto) (part-time)
P.M. Rowe, B.A.(Toronto), M.A.(Dalhousie), Ph.D.(McGill)
R.A. Steffy, B.A.(Albright), M.A., Ph.D.(Illinois)
R.V. Thysell, B.A.(Montana), M.A., Ph.D.(Iowa)
D.L. Wahlsten, B.A.(Alma College), Ph.D.(California, Irvine)
T.G. Waller, B.S., M.S.(Southern Mississippi), Ph.D.(Vanderbilt)
E.E. Ware, B.A., M.A.(Richmond), Ph.D.(Illinois)

Assistant Professors
R.J. Alapack, B.A.(Scranton), M.A., Ph.D.(Duquesne)
F.A. Allard, B.A., B.P.E., M.A., Ph.D.(Waterloo) (part-time)
R.F. Asarnow, B.S.(Rutgers), M.A., Ph.D.(Illinois)
P.E. Bowers, (Mrs.), B.A.(Rosemount), M.A., Ph.D.(Illinois) (part-time)
J.H. Davison, B.A.(York), Ph.D.(Waterloo) (part-time)
J.G. Holmes, B.A., M.A.(Carleton), Ph.D.(North Carolina at Chapel Hill)
R.H. Lalonde, B.Sc.(Fond du Lac), Ph.D.(Waterloo) (part-time)
T.J. Lottman, B.S., M.A.(Xavier), Ph.D.(Loyola of Chicago)
P.J. Naus, B.A., Ph.D.(Nijmegen)
J.E. Orlando, B.A.(Western Ontario), M.A.(Detroit), M.A., Ph.D.(Michigan)
H. Ross (Mrs.), B.A.(Toronto), Ph.D.(North Carolina) (part-time)
M.A. Ross, B.A.(Toronto), M.A., Ph.D.(North Carolina)
K.H. Rubin, B.A.(McGill), M.A., Ph.D.(Penn. State University)
R.D. Seim, B.A.(Queen's), Ph.D.(Waterloo)
G. Underwood, B.Sc.(London), Ph.D.(Sheffield) (visiting)
D.M. Willows, B.A.(Manitoba) M.A., Ph.D.(Waterloo)
Undergraduate Programmes

Introductory Psychology
Psychology 101* is a prerequisite for all subsequent courses in Psychology. To achieve a better understanding of experimentation in Psychology, all students in introductory courses are required to participate in two hours of appropriate psychological research.

General Programme
Students choosing a three-year General programme in Psychology must complete Psychology 101*, 102*, 275, a minimum of three additional full-year Psychology courses or equivalent, and a minimum of eight full-year courses or equivalent in Departments other than Psychology (see also the Arts Faculty General Programme requirements).

Honours Programme
Students choosing the Honours programme in Psychology must complete, before graduation, the equivalent of nine full courses in Psychology. Before entering the fourth year of the programme, all students must complete Psychology 283*, 284*, 285*, 331* and one research half 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.

Honours Psychology with Early Childhood Education and Care Option
Students choosing the Honours Psychology Programme with Early Childhood Education and Care Option fulfill all the requirements listed under the Honours Programme above. In addition, students must be accepted into the option at the beginning of the third year and must have completed the following courses prior to the fourth year: Psychology 101*, 203* or 207*, 211*, 241*, 242*, 283*, 284*, 285*, 293* or 295*, 311*, 321*, 331*, 341*, 393*, Health Studies 140*, 141*, 346* and Recreation 200*.

In the fourth year students must complete Psychology 421, 453*, 498 or 499, Dance 364*, and Health studies 345* and 440*. Before graduation each student must complete a minimum of twenty-two courses. Of these twenty-two courses a minimum of nine courses must be in Psychology with letter grades (Psychology 321* and 421 are offered on a Credit-Fail basis only). A recommended programme is outlined in Chapter 8.
Joint Honours Programme
Students choosing a Joint Honours Programme involving Psychology must complete the equivalent of seven full courses in Psychology and an Honours thesis course. Unless other arrangements are approved by the Department, all students in Joint Honours Programmes must complete, before entering the fourth year, Psychology 283*, 284*, 285*, 331*, and one research half 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, 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.

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

Undergraduate Course Descriptions

The number of hours of lectures shown after the course descriptions is an attempt to indicate the "normal"; each instructor determines how often his particular class will meet.

101* 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.
3 hours

102* Introductory Psychology Special Topics
A more in depth study of selected topics introduced in Psychology 101*.
Prerequisite: Psychology 101*
3 hours

203* 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.
Prerequisite: Psychology 101*
3 hours

205* Sensory Processes
A consideration of data and theory concerning sensory processes. Topics will include psycho-physical methodology, sensory mechanisms and the neuro-psychological basis of perception.
Prerequisite: Psychology 101*
3 hours

206* 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.
Prerequisite: Psychology 101*
3 hours

207* Cognitive Processes
An examination and evaluation of selected topics dealing with human learning, thinking, concept formation, memory and language.
Prerequisite: Psychology 101*
3 hours

211* Developmental Psychology
An examination of the process and factors of human development.
Prerequisite: Psychology 101*
3 hours

214* Psychology of Adolescence
A study of the psychological processes occurring in the second decade of human development. Consideration is given to such areas as intellectual development, emotional and social growth, and identity formation. Current concepts, issues, and research are stressed.
Prerequisite: Psychology 211*
3 hours

218* Aging, Dying and Death
An examination of both the psychological aspects of the aging process and the traditional and recent literature relating to various views as to the part played by the reality of death in the life of man. Recent attempts at therapy with dying individuals are reviewed and evaluated.
Prerequisite: Psychology 101*
3 hours

241* Educational Psychology: The Psychology of Classroom Learning
A consideration of the main variables affecting learning in the classroom with special focus upon the conditions essential to efficient learning.
Prerequisite: Psychology 101*
3 hours
242* Educational Psychology: Learning Disabilities
Analyses of learning disabilities associated with various categories of exceptionality including mental retardation, emotional problems, and receptive and expressive handicaps.
Prerequisite: Psychology 101*
3 hours

253* 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. The general emphasis is on an understanding of the processes which determine how people are affected by their environment and how people in turn shape their world.
Prerequisite: Psychology 101*
3 hours

254* 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.
Prerequisite: Psychology 253*
3 hours

261* Physiological Psychology
The structure and function of the nervous system and their relation to behaviour.
Prerequisite: Psychology 101* or permission of instructor.
3 hours

271* Animal Behaviour
An in depth study of the behaviour of animals emphasizing both observational and experimental research.
Prerequisite: Psychology 101* or permission of instructor
3 hours

275 Statistics and Measurement
An introduction to basic statistical concepts and to the theory and use of psychological tests. Consideration is given to the assessment of personality, intelligence, aptitudes, and interests, and to the analysis of individual and group differences in behaviour.
Required of all students in the General Psychology Programme.
2 hours lecture, 2 hours laboratory

283* Statistical Methods in Psychology
An introduction to the logical and theoretical base for the application of statistical methods to the solution of problems in the social sciences. Consideration will be given to descriptive statistics, to sampling statistics and to an introduction to inferential statistics. Required of all students in Honours Psychology.
3 hours

284* Experimental Design
An examination of the effective use and interpretation of statistics in the design and understanding of experiments in the social sciences. Required of all students in Honours Psychology.
Prerequisite: Psychology 283*
3 hours

285* Tests and Measurements
An introduction to the theory and use of psychological tests. Special emphasis is placed on the assessment of personality, intelligence, aptitudes and interests.
Prerequisite: Psychology 283*
3 hours

293* Research in Learning and Motivation
Open only to students in Honours Psychology (and Joint Honours Programmes with Psychology), and to those students in the General programme who are majoring in Psychology. Open to students in other programmes by permission of instructor only.
Prerequisite: Psychology 283* and one of Psychology 203*, 207* or 271*
2 hours lecture, 2 hours laboratory

295* Research in Perceptual and Cognitive Processes
Open only to students in Honours Psychology (and Joint Honours programmes with Psychology) and to those students in the General Programme who are majoring in Psychology. Open to students in other programmes by permission of instructor only.
Prerequisite: Psychology 283* and one of Psychology 205*, 206* or 207*
2 hours lecture, 2 hours laboratory

297* Research in Biopsychology
Open only to students in Honours Psychology (and Joint Honours programmes with Psychology) and to those students in the General programme who are majoring in Psychology. Open to students in other programmes by permission of instructor only.
Prerequisite: Psychology 283* and one of Psychology 261* or 271*
2 hours lecture, 2 hours laboratory
311* Behaviour and Development of Human Infants
An inquiry into the behaviour and development of human infants in the first two years of life, with emphasis on the implications of current research and theory for infant care.
Prerequisite: Psychology 211* or permission of instructor
3 hours

316* Moral Development
A consideration of psychological theory and research dealing with the nature and origin or moral development, developmental differences in moral judgment, and various approaches to teaching moral behaviour with its consequent effects on the individual.
Prerequisite: Psychology 211*
3 hours

321* Observation and Praticum Experience with Young Children
Directed observation of and supervised experience with young children in group or home settings. Admission by consent of instructor. Graded on a Credit-Fail basis.
Prerequisite: Acceptance into the Early Childhood Education and Care Option
4 hours

331* Individual Differences
An analysis of individual and group differences in behaviour, with emphasis on studies of intelligence.
Prerequisite: Psychology 285*

333* Industrial Psychology
An introduction to the methods and problems in Industrial Psychology.
Prerequisite: Psychology 101*
3 hours
(Cross listed as Management Science 44)

334* Theories of Counselling Psychology
An introduction to the methods, theories and problems in Counselling Psychology.
Prerequisite: Psychology 101*
3 hours

340 Community Psychology
Theory and practice are integrated in an attempt to identify and to understand the social factors which inhibit or facilitate healthy development of the individual. The adequacy of existing social structures and institutions in the treatment of various personal problems is assessed.
Prerequisite: Psychology 253*
3 hours

341* Psychology of Early Childhood Education
An introduction to the field of early childhood education. Topics to be considered include: (1) historical review of the area; (2) application of psychological theory to early childhood education; (3) the disadvantaged child and head start.
Prerequisite: Psychology 211*
3 hours

350 Group and Individual Counselling
Facilitative human relations within the context of education, guidance and interpersonal exchanges are treated in terms of current psychological theories and research. The demonstration and development of these concepts are aided by personal participation, observation and taped sessions. Application to both individual and group interaction.
Prerequisite: Psychology 355*, 357* and 334* or suitable alternative and permission of instructor
3 hours

353* Aggresion and Social Conflict
This course will examine the genetic, physiological, and social causes of aggression, with the emphasis on social-psychological causes. Typically, topics covered will include an analysis of interpersonal and intergroup conflict and hostility; the effects of social deterrents, scarce resources, competition and cooperation, and prejudice; and the causes of revolutions and international disputes.
Prerequisite: Psychology 253*
Offered on alternate years. Not offered 1975/76
3 hours

354* Interpersonal Processes in Critical Situations
The course will examine reactions to other people’s misfortunes such as serious physical and mental illness, natural disasters, poverty and discrimination. The focus will be on the understanding of the processes which occur within the observer and how these processes are reflected in interpersonal behaviour such as helping, condemnation, and social action.
Prerequisite: Psychology 253*
Offered on alternate years. Will be offered 1975/76
3 hours

355* Personality Theory
An examination and evaluation of some of the outstanding theories of personality.
Prerequisite: Psychology 101*
3 hours

357* Psychopathology
The nature and origin of deviant behaviour.
Prerequisite: Psychology 101*
3 hours
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.
Prerequisite: Psychology 355*
3 hours

363*(A-E)-366*(A-E) Special Subjects
One or more half courses will be offered at different times as announced by the Department.
Prerequisite: Consent of instructor

Research in Development Psychology
Open only to students in Honours Psychology (and Joint Honours programmes with Psychology) and to those students in the General programmes who are majoring in Psychology. Open to students in other programmes by permission of instructor only.
Prerequisite: Psychology 283* and Psychology 211* or 331*
2 hours lecture, 2 hours laboratory

Research in Social Psychology
Open only to students in Honours Psychology and Joint Honours programmes with Psychology) and to those students in the General programme who are majoring in Psychology. Open to students in other programmes by permission of instructor only.
Prerequisite: Psychology 283* and 253*.
2 hours lecture, 2 hours laboratory

Research in Personality and Psychopathology
Open only to students in Honours Psychology (and Joint Honours programmes with Psychology) and to those students in the General programme who are majoring in Psychology. Open to students in other programmes by permission of instructor only.
Prerequisite: Psychology 283* and one of Psychology 331*, 355* or 357*
2 hours lecture, 2 hours laboratory

History and Systems
An examination of current theoretical approaches to psychological problems present in a historical context.
2 hours

Senior Practicum in Preschool Groups
Laboratory experience for advanced students in guiding and supervising developmental experience for young children. Consideration of professional practical matters of organization and administration in early childhood education and care.
Prerequisite: Psychology 321*
Graded on a Credit-Fail basis
4 hours

Seminars

Senior Seminar in Learning
Admission by consent of instructor
2 hours

Senior Seminar in Perception
Admission by consent of instructor
2 hours

Senior Seminar in Development Psychology
Admission by consent of instructor
2 hours

Senior Seminar in Educational Psychology
Admission by consent of instructor
2 hours

Senior Seminar in Social Psychology
Admission by consent of instructor
2 hours

Senior Seminar in Personality
Admission by consent of instructor
2 hours

Senior Seminar in Clinical Psychology
Admission by consent of instructor
2 hours

Senior Seminar in Cognitive Processes
Admission by consent of instructor
2 hours

Senior Seminar in Motivation
Admission by consent of instructor
2 hours

Senior Seminar in Physiological Psychology
Admission by consent of instructor
2 hours

Senior Seminar in Animal Behaviour
Admission by consent of instructor
2 hours

Senior Seminar in Special Topics
Admission by consent of instructor
2 hours
466* Senior Seminar in Special Topics
Admission by consent of instructor
2 hours

480 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.
3 hours

498 Senior Honours Essay - Review Paper
Each student will work under the direction of a member of the department on a critical integrative review of an issue in the research literature. The result of this review will be presented in the form of a thesis, which will be critically examined by members of the department and, when appropriate, members of other departments. Either 498 or 499 is required of all students in Honours Psychology.

499 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 and, when appropriate, by members of other departments. Either 498 or 499 is required of all students in Honours Psychology.

The following courses are administered by Renison College. Since these courses are intended primarily for students in the Social Development programme, students planning a General or Honours Psychology programme must consult their faculty advisor concerning Psychology major credit for these courses.

120R*/121R* Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science, with special emphasis on social aspects of behaviour. 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 and environmental factors.
Prerequisite: none
Fall/Winter terms

220R*/221R* Social Psychology
An examination of psychological principles involved in the interaction of individual and society. Emphasis on social attraction, socialization of the child, language and social communication, interpersonal perception, attitude formation, personality and society, status and roles, social control, group dynamics and leadership.
Prerequisite: introductory psychology course
Fall/Winter terms

322R*/323R* Social Functioning and Human Behaviour
Relationships between models of the nature of the human being and social structures. Psycho-analytic, existential, behaviouristic and humanistic models will be examined. Contrasts of views of abnormal behaviour as human experiencing, personality disorder, social problems, and a manifestation of culture. A brief summary of treatment procedures with social emphasis on community-based approaches to treatment and prevention.
Prerequisite: Introductory psychology course
Fall/Winter terms

334*(R) Theories of Counselling Psychology
An introduction to the theories, methods and problems in Counselling Psychology.
Prerequisite: Introductory psychology course
Fall term

367R*.369R* 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.
367R* Fantasy Processes
An examination of the role of fantasy in the normally functioning human being. Aspects of human experiencing will be explored in which fantasy processes are basic and essential (e.g. dreaming, day-dreaming, play, creativity, aesthetic sensitivity). Therapeutic applications of fantasy approaches will be explored partially through experiential involvement.
Prerequisite: Introductory psychology course
Winter term

368R* Social Psychology of Men
The emergence of the women's movement has provoked and threatened many men, producing anger, bitterness, confusion and guilt. Yet a perplexing question has been raised: what does it mean "to be a man" in our society? What should it mean? In an attempt to answer these questions the course will examine socialization and development, affiliation and emotional expressiveness, power and violence, fatherhood, work, sexuality, marriage.
Prerequisite: Introductory psychology course
Winter term

398R*-399R* Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of psychology. This course may be undertaken by an individual or small group of students with one of the faculty members from the Social Development Studies Programme.
Department of Recreation

Professor, Chairman of the Department
W.F. Theobald, B.S.(Seton Hall), M.A., Ed.D. (Columbia)

Professor, Dean of the Faculty
G.S. Kenyon, B.P.E.(U.B.C.), M.S.(Indiana), Ph.D. (N.Y.U.)

Associate Professor, Associate Chairman, Undergraduate Affairs
D. Ng, B.A.(Lingnan), M.A.(Carver), M.Sc., Re.D. (Indiana)

Professor
E.M. Avedon, B.S.S.(William and Mary), M.A., Ed.D. (Columbia)

Associate Professors
D.M. Crapo, B.P.E.(Alberta), M.S., Ph.D.(Michigan State)
C.A. Griffith, B.A.(Sir George Williams), M.S., Re.D. (Indiana)
G.A. Hayes, B.S.(California State), M.S.(North Carolina), Ph.D.(North Texas State)

Assistant Professors
D.J. Arnold, B.P.E.(U.B.C.), M.Sc.(San Francisco), Re.D.(Indiana)
K. Balmer, B.A.(Toronto), Ph.D.(Liverpool)
R. Johnson, B.A., M.A.(Windsor), Ph.D.(Minnesota)

Lecturer
J. Levy, B.A.(Waterloo Lutheran), B.P.E.(Waterloo), M.S.W.(Waterloo Lutheran)
R. Capling, B.A.(Western Ontario), M.Ed.(O.I.S.E.) (part-time)
L. Rullman, B.S., M.Ed.(Minnesota) (part-time)

Course Descriptions

Undergraduate Course Descriptions

100* Introduction to the Study of Leisure and Recreation
A course designed to develop an overview of the total field of recreation and an understanding of the leisure phenomena and the implications for contemporary society.
3 lectures, Fall term

101* Introduction to Leisure Services
An introduction to various leisure service agencies and the services provided. Field trips to municipalities, specialized institutions, and voluntary agencies.
Prerequisite: Recreation students only
1 two-hour lecture and one hour discussion session
Fall and Winter terms

200* 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.
3 lectures, Fall and Winter terms

210* 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.
3 lectures, Fall, Winter and Spring terms

220* Recreation Programme Planning
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, and leadership through direct experience. Specific reference will be given to the techniques of programme leadership in music, drama, dance, games and social recreation.
2 lectures, 2 hours lab, Fall and Winter terms

230* Introduction to Outdoor Education and Recreation
A study of outdoor education and recreation in relation to contemporary lifestyles, natural and human resource systems. Includes the examination of outdoor settings as an integral part of an education – outdoor recreation continuum. Includes the role of selected governmental and non-governmental bodies and their programmes.
3 lectures, Fall and Winter terms
241* Administration of Camping and Outdoor Education
The philosophy and objectives of camping and outdoor education; administration, organization, 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 with particular reference to administrative policies and procedures.
Prerequisite: Recreation 230*
3 lectures, Winter term

250* Introduction to Therapeutic Recreation
Examines the philosophical, theoretical and empirical frameworks of recreation as a therapeutic service and process to individuals with physical, emotional and intellectual disabilities.
3 lectures, Wall and Winter terms

252* Recreation and Mental Retardation
An analysis of the motoric and psycho-social behavioral dimensions specific to the retarded with direct and obvious applicability to the planning, implementing and evaluating of recreational programs.
Prerequisite: Recreation 250* and Psychology 242*
3 lectures, Winter and Spring terms

253* 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.
Prerequisite: Recreation 250*, and permission of instructor
3 lectures, Fall term

254* 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.
Prerequisite: Recreation 250*
3 lectures, Fall term

270* 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.
3 lectures, 1 hour lab, Fall and Winter terms

271* 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.
Prerequisite: Recreation 270*
3 lectures, Fall Winter and Spring terms

300* Philosophy of Leisure
Examination of major philosophical themes through the ages with reference to contemporary viability and effect upon social behaviour.
Prerequisite: Consent of instructor
3 lectures, Fall and Winter terms

301* Sociology of Leisure (Sociology 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.
Prerequisite: Two term courses in Sociology, e.g. Sociology 101* and 341*
3 lectures, Fall and Winter terms

302* 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.
Prerequisite: Recreation 301*
3 lectures, Winter term

303* Sport in Society (Kinesiology 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.
Prerequisite: Sociology 101* and one other Sociology course
3 lectures, Winter and Spring terms

306* 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.
Prerequisite: Recreation 301*, Psychology 357*, and advanced standing
3 lectures, Winter term
307* Group Processes in Physical Activity
(Kinesiology 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. *Prerequisite: 2 term courses in Psychology, or consent of instructor
3 lectures, Winter and Spring terms

311* School Recreation
An analysis of the relationship between recreation and education with particular emphasis on the sponsorship of community recreation programmes by education authorities including leisure education and co-curriculum activities. *Prerequisites: Recreation 210*
3 lectures, (Not offered in 1975-76)

312 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. They will participate actively in a community action group as a means of relating theory to real world situations. *Prerequisite: Recreation 210*
3 lectures, Fall term

316* Principles of Recreation Planning
(Planning 344*)
An exploration of the nature and functions of recreation in modern urban-industrial societies and an analysis of alternative approaches to the planning of recreation opportunities in urban-centred regions. The demand for and supply of recreation opportunities; standards, models and systems; recreation planning policies and agencies; and selected recreation planning issues. *Prerequisite: Planning 100 or a full credit in Geography, or consent of instructor
3 lectures, Winter term

320* 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. *Prerequisite: Recreation 220*
2 lectures, 2 hours lab in community agencies, Winter term

321*—324* 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. *Prerequisite: Consent of instructor

330* Outdoor Recreation
The present status of outdoor recreation in modern society; government functions and policies related to outdoor recreation services; the planning and administration of outdoor recreation activities. Current problems. *Prerequisite: Recreation 230*, lab fee approximately $15.00
2 lectures, 2 hours lab, Fall and Spring terms

332* Theory and Practice in Outdoor Education
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. *Prerequisite: Recreation 230*, 241*
2 lectures, 2 hours lab, (lab fee $25), Fall term

334* Park Management
Basic administrative procedures in park management. Operational techniques are examined together with general policies of acquisition, operation and development. *Prerequisite: Recreation 210*, Recreation 230*, or equivalent
3 lectures, Fall term

361* Aging and Leisure
Social parameters of the aging process with particular reference to the Leisure Service Industry. *Prerequisite: Recreation 301*

370* 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. *Prerequisite: Faculty approval, Fall, Winter and Spring terms

400* Seminar in Recreation and Leisure
An in depth analysis of the current major issues and trends. *Fourth year Departmental students only
3 hours, Fall, Winter and Spring terms
402* Colloquium on Religion and Leisure
Theological notions as they relate to theories of leisure. Contemporary trends and behaviour which affect organized religion, and other leisure-related institutions. Issues for possible consideration, e.g. - public ritual as a leisure and religious phenomenon, leisure forms and liturgy, leisure as prayer, the church and a leisure ethic, ministering in 'mass leisure', the Sabbath and leisure.
Prerequisite: A course in philosophy and theology, or consent of the instructor
3 lectures, (Not offered in 1975-76)

406 Comparative Recreation Systems
A study of multi-national recreation systems. Course meets on Campus and in the field in other countries. Full term study over a period of 6-8 weeks. Laboratory fee varies with field observation.
Spring term

410* Planning of Recreation Facilities
A course to introduce the student to the planning, design and layout to recreation areas and facilities.
Prerequisite: Recreation 210*
3 lectures, Fall term

432* Advanced Theory and Practice in Outdoor Education
Concepts, philosophy and practices relative to the enrichment of school and community curricula through the use of the natural environment. Emphasis on the role of the school and the community. The provincial and federal government relative to a systems approach toward an integrated design for leadership programmes, areas, facilities and management.
Prerequisite: Recreation 332* or consent of the instructor
2 lectures, 2 hours lab. Lab fee approximately $25.00, Winter term

434* 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.
Prerequisite: Recreation 334*
3 lectures, Winter term

470*/471* 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.
Recreation 470* includes an approved design and completion of the first segment of the paper.
Prerequisite: Completion of an honours optional course sequence
3 lectures, Fall, Winter and Spring terms
Recreation 471* requires the completion of the project begun in 470*.
Prerequisite: Recreation 470*
Fall, Winter and Spring terms
Religious Studies

Professor
W. Klaassen, B.A.(McMaster), B.D.(McMaster Divinity School), D.Phil.(Oxford) G

Associate Professors
A.M. McLachlin, M.A.(Toronto), B.D., Th.D. (Emmanuel) P
A.F. Thompson, B.A.(Toronto), B.Th.(Huron), M.A. (Western), S.T.M., Ph.D.(McGill) P

Assistant Professors
W.J. Bildstein, B.A.(Western), S.T.B.(Gregorian), M.A.(Windsor), S.T.D.(Angelicum) J
R.M. Bird, B.A., M.A.(Iowa) R
M.D. Bryant, B.A.(Concordia), S.T.B.(Harvard), M.A. (Toronto) R
B.J. Hubbard, B.A.(Seattle), M.A.(Marquette), Ph.D. (Iowa) J
R.D. Legge, B.A.(Transylvania), S.T.B.(Harvard), Ph.D.(McMaster) P
D.R. Newman, B.A.(Toronto), B.D.(Emmanuel), M.A.(Toronto) P
D. Sahas, B.D.(Athens), S.T.M.(Christian Theological Seminary), Ph.D.(Hartford Seminary Foundation) P
R. Sawatsky, B.A.(Bethel College), M.A.(Minnesota), M.A.(Princeton) G
J.D. Whitehead, B.A.(Toronto), Ph.D.(Chicago) J

Lecturers (part-time)
W.G. Walker, B.F.A(Cincinnati), M.Ed.(Xavier), M.A.(Marquette) J
P.K. Hawkes, B.A.(Queen's), B.D.(Emmanuel), M.A.(Toronto) P

Note 1
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.

Note 2
Students majoring in Religious Studies must have their programmes approved by the undergraduate officer. Each student is required to take any 100 level R.S. course in the first year and two R.S. courses in each of the two subsequent years. These courses should be selected from at least two of the following four main categories of approaches to religious phenomena (the decade grouping of the numbering scheme will guide the student in making this selection):

Course Categories and Numbering Scheme
1) Studies in Religious Texts
   00-09
2) Studies in the History of Religions
   10-19
   A) History of Religions
   20-29
   B) History of the Christian Church
3) Theological - Philosophical Studies
   30-39
   A) Theological
   40-49
   B) Philosophical
   50-59
   C) Ethics
4) Cultural Studies
   60-69
   A) Religion and Culture
   70-79
   B) Religion and the Social Sciences

Note 3
The honours programme in Religious Studies can be found in Chapter 8 of this Calendar.

Note 4
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.

Note 5
Courses designated with suffix G (Conrad Grebel), J (St. Jerome's), P (St. Paul's), and R (Renison) are administered by the respective Colleges.
Undergraduate Course Descriptions

103G*/103J* Introduction to Biblical Studies 1
A survey of the literature, history and religion of ancient Israel as seen in its cultural background in the Ancient Near East.
3 lectures, Fall term

104G*/104J* Introduction to Biblical Studies 2
A survey of the literature, history and religious thought of the Christian community during the New Testament period as seen in its cultural setting in the Greco-Roman world.
3 lectures, Winter term

105J Elementary Biblical Hebrew
A study of the phonemic structure of Biblical Hebrew, elementary technical points, morphology of the noun, verb, etc.; numerals; an introduction to Hebrew Syntax. Written exercises in both Hebrew and English. Reading of selected portions of the Hebrew scriptures.
This course is offered in 1975-76 at St. Jerome's College through cross-registration, and in alternate years at Wilfrid Laurier University.
3 hours

106P 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.
3 lectures

110* Religions of Mankind 1
An introduction to the religious traditions of the East: history, religious beliefs and practices of Hinduism, Buddhism, Confucianism, Taoism and Shinto.
3 lectures, Fall and Winter terms

111* Religions of Mankind 2
Encounter with Judaism, Christianity and Islam: the history and interaction of the three major religious traditions which have shaped the image of the Western World.
3 lectures, Fall and Winter terms

130P* Introduction to Theology
A study of the nature of the Christian faith with consideration of questions such as these: How do you speak of God in a secular age? What significance have the Bible and Church doctrines for history and faith? Who is Jesus? the Cross and Resurrection; the question of Salvation.
3 lectures, Fall term

131P* Introduction to Theology
Further study of the Christian faith to include the questions and issues: What is man? What is freedom? Is there a Christian lifestyle? the new morality; Man and Nature; the Church: Mission and Worship; the Future.
3 lectures, Winter term

160R* Religion and Culture 1
An introductory exploration of the interrelationships of religion and culture through the medium of the arts. A consideration of the religious dimensions of man's artistic, personal and social quest in cultures East and West.
3 lectures, Fall term

161R* Religion and Culture 2
An exploration of religion as the "substance of culture" and culture as "the form of religion". The manifestation of this relationship in terms of the quest for meaning, the evolution of human sexuality, the creation of the "good society" and the creations of the fine arts.
3 lectures, Winter term

203G* Wisdom Literature in the Old Testament
A study of Proverbs, Job, Ecclesiastes and other wisdom writings in ancient Israel, against their Near Eastern background.
3 lectures, Fall term
Not offered in 1975-76

204G* Worship Life in Ancient Israel
A study of the festivals, prayers and liturgies of the Old Testament against the background of worship practices in the ancient Near East.
3 lectures, Winter term
Not offered in 1975-76

205G* The Hebrew Prophets
A study of the writings of Amos, Hosea, First Isaiah, Second Isaiah, Micah, Jeremiah, and Ezekiel in the historical, social, and religious context of the ancient world and of their influence upon the development of religious life and thought.
3 lectures, Winter term

206G* 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.
3 lectures, Winter term
207G* 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.
Prerequisite: R.S. 104G*, 2021* or consent of the instructor
3 lectures, Fall term

209G* Cultural Conflict in Early Christianity
A study of the conflict within the early church over the nature of the Christian message and community, with special consideration of the writings of Paul, one of the leading missionaries and theologians of the church.
3 lectures, Winter term

212J* Ancient Near Eastern Religions
An analysis of the myths, epics, legends, rituals, incantation, prayers and festival texts of ancient Near Eastern peoples, with special emphasis on the religions of Egypt, Mesopotamia and Canaan-Phoenicia.
3 lectures, Fall term

213* Hinduism
A study of the development of religious thought in India from the Vedic Period to the present. The course will combine a historical survey with a study of representative texts from the religious, philosophical, social, and political thought of the Hindus.
3 lectures, Fall term

214* Buddhism in India, China and Japan
This course consists of a historical survey of the essential doctrines and practices of Buddhism in India, China and Japan, along with a study of representative texts from the various schools of thought.
3 lectures, Fall term

215* Chinese Religions
A historical survey of the various expressions of Chinese spirituality from the classical period to the present. Special attention will be given to the dynamics between the indigenous traditions (e.g., Taoism) and those imported into China (e.g., Buddhism).
3 lectures, Winter term

216* Islam
The religion of the Muslims through the fourteen centuries of its existence. An introduction to the life and the personality of Muhammad the Prophet, the Qur'an, the Muslim Tradition, the development of the Muslim Theology and Philosophy, Sufism, Muslim expansion and civilization, Muslim life and piety, and present condition of the religion in the Muslim world.
3 lectures, Winter term

217* Judaism
The religion of the Jews through the 4000 years of its existence. An introduction to the history, scriptures and literature, intellectual life and spiritual experience of the Jewish people.
3 lectures, Fall term

218* Christianity
An introduction to the Christian tradition in retrospect; the facts and the experiences pertinent to the evolution of beliefs, institutions, practices and cultural expressions, as these elements delineate the essential identity of Christianity as one of the religious traditions of the world.
3 lectures, Winter term

220G* Religious Styles in Recent Western History 1
The Fundamentalist Movement. A consideration of religious pluralism in recent Western society. This development will be examined by giving special consideration to the Fundamentalist movement and allied phenomena such as Pentecostalism, revivalism, reactionary political groups, the Jesus People, and the emphasis on the Second Coming.
3 lectures, Fall term

221G* Religious Styles in Recent Western History 2
The Denominational Society. As above with special consideration given to certain denominations, sects and ethnic groups. The particular groups examined will vary according to the interests of the students and instructor, but might include Mormons, Methodists, Scientologists, Hutterites, the United Church of Canada and Reform Jews.
3 lectures, Winter term

227G*/228G* (Hist. 235G*/236G*) History of Christianity 1 and 2
The object of this course is to study the historical development of Christianity from its beginnings to the present as well as the institutions and doctrines expressed in the major forms of Roman Catholicism, Eastern Orthodoxy and Protestantism.
3 lectures, Fall and Winter terms

231J The Evolution of Christian Thought: A Catholic Survey
An analysis of the major developments in Christian belief, practice and thought through the centuries. The course will examine the question of faith as a personal encounter: God meeting man; man meeting God in faith; the transmission of God's message in terms of personal communion between God and man in Christ - Kerygma, community, doctrine.
3 lectures
Course Descriptions
Religious Studies

232J Christ and Contemporary Man
A systematic reflection on the revolution in contemporary consciousness, and its significance for the understanding of Jesus in a secular and pluralistic world. An examination and theological-historical critique of some current symbolic images of the Christ figure: as clown, superstar, revolutionary, social deviant, charismatic, brother, and the “man for others”.
2 lectures

233P*/234P* Contemporary Atheism and Faith in God
An examination of the sources of atheism in Western culture, the question of God in philosophy, the denial of theism and of the God of Christian faith, the hollow universe. Questions contemporary atheists ask of the Christian faith, and the response of faith. The thought of representative atheists: Nietzsche, Feuerbach, Marx, Freud, Russell, Sartre, Ayer. Experimental restatements of theism.
3 lectures. Fall and Winter terms
Prerequisite: Consent of the instructor

235J* Issues in Catholic Moral Theology 1
A study in moral theology of current social problems such as racism, war, poverty, urban crises, management versus labour, air and water pollution, the population explosion in the light of a Catholic interpretation of Judaico-Christian concern. Concrete possibilities for individual initiative toward needed social change will be stressed.
Prerequisite: 2nd year standing or consent of instructor
2 lectures, Fall term

236J* Issues in Catholic Moral Theology 2
An investigation of the moral implications of an evolving sexual consciousness on the Christian tradition. Concentration to be given to an analysis and critique of developments in the areas of current mythologies regarding marriage and sexuality, divorce and remarriage, birth control and responsible parenthood, abortion, celibacy, homosexuality, and eugenics.
Prerequisite: 2nd year standing or consent of instructor
2 lectures, Winter term

238J The Ecumenical Movement
An examination of the origin and history of the modern ecumenical movement through a study of its important leaders and events. Documents of the different Christian Churches will be examined and major doctrines in the Christian understanding of the Church will be analysed: Word, Authority, and Sacrament.
3 lectures

253G* 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.
3 lectures, Fall term

254G* 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 within, between and beyond those groups which represented a Christian pacifist stance such as the Quakers, Mennonites and Brethren.
3 lectures, Winter term

255P* Introduction to Christian Ethics 1
An introductory study of the relationship between Christian faith and moral decision as expressed in major ethical writings both historical and contemporary. Special reference will be made to such historical authors as Augustine, Aquinas, Luther and Calvin, and among more recent authors, Barth, Bonhoeffer, the Niebuhrs, Lehmann, Curran and Gustafson.
3 lectures, Fall term

256P* Introduction to Christian Ethics 2
A continuation of the study of Christian ethical thinking. Such thematic considerations as the Christian view of human nature, the tension between freedom and law, principle vs. situation, love as an ethical norm and the individual and community, will be discussed with reference to the writers studied in R.S. 255P.
3 lectures, Winter term

262R* Religion and Politics 1
An historical examination of the relationship between religion and politics from primitive to modern societies. Special focus will vary from year to year. (Fall 1975 focus will be the Quest for the City).
Prerequisite: one full course in RS or consent of instructor
3 lectures, Fall term

263R* Religion and Politics 2
An examination of the relationship between religion and politics in the 20th century. Areas of concentration will vary from year to year, and will include the following topics: the Nazi phenomenon, the Christian-Marxist dialogue in Latin America and Europe, and movements of the “re-birth of politics”.
3 lectures, Winter term
264P* 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.
3 lectures, Fall term

265P* 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.
Prerequisite: R.S. 264P*
3 lectures, Winter term

266R* 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. Film fee: $5.00.
3 lectures, Fall term

267R* 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, Pasolina, Kurosawa, Fellini, Pintonioni, Polanski.
Film fee: $5.00
3 lectures, Fall term

270P* Psychology of Religion
A study of theories of the psychological nature of religious experience, the sources of religious belief and religious significance of psychological phenomena. Topics include faith, doubt, evangelism, conversion, faith healing, mysticism, drugs and religious experience, tongue-speaking.
3 lectures, Fall term

275G* 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.
3 lectures, Winter term

280G* The Parables of Jesus
Detailed examination of the stories Jesus told, their form, method, message, and significance for religious thought, past and present.
3 lectures, Fall term

298*-299*
Directed Readings in Special Subjects.

301J* Palestinian Archaeology
An introduction to archaeological discoveries in Palestine. The course will deal with selected evidence for each successive archaeological period, with particular emphasis on those periods and sites which shed light on biblical sources from both the Old and New Testaments. Other areas of concern will include a critical introduction to methods of excavation and a discussion of the applicability of archaeological evidence to the reconstruction of the history and culture of the ancient Near East.

303J Palestinian Archaeology: Field Experience
Participation in an archaeological excavation jointly sponsored by several institutions. The programme, which lasts for six weeks, will include training and experience in actual field work as well as lectures on the history of excavation in Palestine and on archaeological method.
Not offered in 1975-76

304J* Selected Topics in Israelite Religion
Studies in the development of Israelite religion.
Prerequisite: RS 103G/J (2011) or consent of instructor
2 hours, Seminar, Winter term

305P Intermediate New Testament Greek
Prerequisite: RS 106 or consent of the instructor
3 hours

306J Intermediate Biblical Hebrew
Reading and grammatical analysis of selected prose and poetic portions of the Hebrew Bible.
Prerequisite: RS 105I or the equivalent

Note
This course is offered at WLU in 1975-76 through cross-registration, and in alternate years at St. Jerome's College.
308J Intertestamental Judaism
A study of Jewish literature of the two centuries before Christianity and the first century A.D. (C.E.) with special reference to apocalyptic writings (including the Dead Sea Scrolls) and their influence upon early Christianity and the subsequent development of Judaism.
2 hours, Winter term

309P* The Theologians of Early Christianity
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.
Prerequisite: RS 202J*, 104G* or consent of the instructor
Fall term

313* Modern Religious Movements in India
A study of the development of Hinduism from medieval times to the present, with emphasis on new movements of religion and thought in the 19th and 20th centuries. Selected texts will illustrate Indian responses to the impact of the West and new expressions of Hinduism in social concern, faith and philosophy.
Prerequisite: RS 110*, 213* or consent of the instructor
Not offered 1975-76

314* Zen Buddhism
A seminar based on interpretations of Zen, East and West. The course will develop through four areas of concern: a) basic Mahayana principles, b) the uniqueness of Zen within Mahayana, c) Eastern interpretations, and d) Western interpretations.
Winter term

321G* (History 347G*) Radical Reformation 1
A study of spokesmen for radical reform of the church including Andreas Carlstadt, Thomas Müntzer, Caspar Schwenckfeld, Sebastian Franck, Michael Servetus and others.
3 lectures, Fall term

322G* (History 348G*) Radical Reformation 2
A study of Anabaptism and its place in the history of the Christian church and of the Reformation period.
3 lectures, Winter term

323* (History 353*) Medieval Church History from 312-1122
A study of the evolution of the dogmatic approach. Topics will include dogmatic, moral and political questions which have affected the teaching of the Church.
3 hours, lectures and seminars, Fall term

324J* (History 354*) Medieval Church History from 1112-1449
A study of the evolution of the dogmatic approach. Topics will include dogmatic, moral and political questions which have affected the teaching of the Church.
3 hours, lectures and seminars, Winter term

325* The Orthodox Church
A study of “Eastern” Christianity; its history, theology, culture, spiritual experience, and its situation in modern Greece, Russian, Eastern Europe, the Middle East, and in the West.
Not offered 1975-76

329* The History and Methodology of the History of Religions
A survey of the history of the study of Religion and of the religious phenomena and traditions, as well as the methodology or methodologies developed in this field, from the Classical Antiquity to the present.
Prerequisite: R.S. 110*, 111* or any course in the 213*-218* sequence
Not offered in 1975-76

331J The Church in the Modern World
An examination of the technological society and an investigation of the capacity and willingness of the Church to respond to the challenges presented by a radically new world situation. Special consideration of controversial questions: War and Non-Violence; Politics and Revolution; Secularism and Secularization; Racism and Poverty; Sexuality and Marriage.
Not offered in 1975-76

332R* Fantasy
A thematic consideration of fantasy and related elements such as play, festivity, imagination, celebration and ritual as they pertain to religious thought and experience.
Prerequisite: 2nd year standing or consent of the instructor
3 hours, Fall term
333J* Creativity
A theological reflection on the idea of creativity by studying the play of the Creator and by investigating what has traditionally been thought of as rest and celebration and what these could be for 20th century man and woman seeking "leisure for God". A creative look at several patterns of religious experience.
Prerequisite: 2nd year standing or consent of the instructor
2 hours, Fall term

334* Islamic Theology, Philosophy and Mysticism
A survey of the development of Islamic theology and philosophy from the beginning of sectarianism to the dawn of 20th century, and with a study of the contribution of the mystics (sufis) to Islamic thought. The course will introduce for study various texts from representative figures and schools of thought.
Prerequisite: R.S. 111*, R.S. 216* or consent of the instructor
Not offered 1975-76

336P Contemporary Theology
The sources of contemporary theology in 18th and 19th century thought, with particular reference to Kant, Schleiermacher and Kierkegaard. Selected 20th century theologians, including Buber, Barth, Tillich, Bonhoeffer and Teilhard de Chardin. Special attention to current themes such as secularization, the 'death of God', hope and the recovery of religion.
2 hours

351J* Contemporary Western Mysticism
A theological interpretation of the 20th century search for self-meaning and expansion of consciousness with emphasis given to the following approaches: the psychedelic, the psychotherapeutic, the ecological, the sexual, the monastic, the revolutionary, and the scientific.
Prerequisite: 2nd year standing or the consent of the instructor
2 hours, Fall term

352P* Situation Ethics
An examination of the new morality that places the emphasis in ethical decision-making on the situation. The course will include consideration of the writings of Fletcher, H.R. Niebuhr, Barth, Bonhoeffer and Lehmann.
Prerequisite: 2nd year standing or the consent of the instructor
Not offered in 1975-76

353* Ethics in Indian Thought
A study of ethical theory in the classical literature of India – the Vedas and the Upanisads, the unorthodox systems of the Carvakas (materialists), the Jains and Buddhists, the six orthodox schools and the Bhagavadgita – and in the modern period – the thought of Tagore, Radhakrishnan, Gandhi and Nehru.
Prerequisite: RS 110*
Not offered 1975-76

360R* Sacred and Profane in the Arts 1
A consideration of "the holy" and of categories of sacred and profane in the arts. Thematic and methodological issues will be explored in the areas of painting, music, architecture, dance and cinema.
Prerequisite: An introductory RS course or consent of the instructor
3 lectures, Fall term

361R* Sacred and Profane in the Arts 2
A continuation of issues in 360R*.
Prerequisite: RS 360R* or consent of instructor
3 lectures, Winter term

365* 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.
Not offered 1975-76

366R* Religion and Contemporary Literature 1
A discussion of fundamental presuppositions concerning the relationship of religion and literature in general. Subsequently, an investigation of religion as a factor in literary vision, drawing from a wide selection of writings, including novels, essays, poetry and short stories from Eastern and Western cultures.
Prerequisite: Any introductory R.S. course or consent of the instructor
3 lectures, Fall term

367R* Religion and Contemporary Literature 2
A thematic consideration of religious questions in contemporary literature. Reading selections will include in addition to selected theological writings a variety of representative materials from contemporary authors.
Prerequisite: Any introductory R.S. course or consent of the instructor
3 lectures, Winter term
373* Religion and Social Change in the Third World
A study of basic issues that have arisen in the interaction of Hinduism, Buddhism, Islam and Christianity with politics and social change in selected areas of the Third World.
Prerequisite: R.S. 110*/111* or consent of the instructor
Fall term

398*-399* Directed Reading in Special Subjects†

401 Studies in Jewish Scriptures†

402 Studies in the Christian Scriptures†

415 Studies in Comparative Religion†

425 Studies in Church History†

430 Studies in Historical Theology†

431 Studies in Contemporary Religious Thought†

432 Studies in Selected Theological Problems†

433L* The Problem of Authority in Contemporary Catholicism
This course will analyse the erosion of the traditional bases of authority in Roman Catholicism since the Second Vatican Council in 1965 and the Papal Encyclical “Of Human Life” in 1967. Special consideration will be given to the change in attitude toward the central authorities of the church, especially the papacy, as a result of the emergence of the laity in church government, and the implementation of the principles of subsidiarity, collegiality, the supremacy of conscience and responsible disobedience, all of which arose in some way from the Second Vatican Council.
Prerequisite: consent of the instructor
2 lectures, Winter term

460R*-463R* Special Topics in Religion and Culture
Focus on themes, development or the work of individual thinkers who have devoted study to the relationship of religion and culture.

490-499 Senior Seminars in Special Topics
Seminars are offered each year for senior honours R.S. students and senior students from other departments who have taken sufficient relevant survey and/or depth courses in R.S. or related disciplines. The instructors of and topics for the seminars are announced prior to the preregistration period. In all cases the instructor’s permission is required.

Note
Every student in the Honour R.S. Programme is required to take at least one of these seminars.

598*/599*
Directed reading in Special Subjects for graduate students.

† Students wishing to enrol in a course marked with a dagger (†) should consult the department.
Science

The Faculty of Science offers the following courses of a general nature, intended for students registered in other Faculties (Arts, Environmental Studies, Engineering, Mathematics, Human Kinetics and Leisure Studies) as well as for Science students desiring electives. Normally, no more than eight of these Science term courses (or their equivalent) at the 100-, 200- or 300-level may be applied towards any Science degree programme.

100* Geological Foundations of the Environment
2 lectures per week, 2 hours laboratory alternate weeks, Fall term
Not normally available to students in Regular Science programmes

Note
Students desiring a full-year Geology elective should consider Earth Sciences 130 (Introductory Geology) to be found in the listings of the Earth Sciences Department. Students who are taking, or have taken Earth Sciences 130 may not take Science 100* for credit because of overlapping material.

110* From Matter to Man
Astronomy: Origin and evolution of the Universe; Galaxies, Stellar and Solar Systems, 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 prerequisites
3 lectures, Fall term

A special division of this course may be offered to first year Engineering students in the Fall term or in other terms if sufficient demand exists.

111* 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 prerequisites
3 lectures, Winter term

120 The Physical Sciences
A survey of science specially designed for the needs of elementary school teachers. The lectures will provide a coherent background knowledge of astronomy, geology, physics and chemistry which will enable a teacher to answer questions presented by today's enlightened students. Workshop and discussion sessions will stress communicating the ideas of science to students in all grades.
No specific prerequisites except an interest in teaching science
3 lectures or discussion sessions per week for two terms (Fall and Winter), offered in the evening

160* Computational Methods in Science
The digital computer and graphical methods of problem solving in science will be used in the discussion of topics selected from: elementary data analysis, elementary functions, numerical and graphical differentiation and integration, solution of algebraic and differential equations, series approximation. Examples will be selected from Biology, Chemistry, Earth Sciences and Physics.
Intended for first year Science students. Offered on a CR/NCR basis
No prerequisites
3 lectures or discussion sessions per week, Fall term

200* Contemporary Science 1
An examination of some of the issues and development in contemporary science (e.g., molecular biology, astrophysics, etc.) at a non-technical level. The interaction between science and society will also be discussed. Extensive skills or background knowledge in mathematics or science are not necessary. Open to first year or upper year students. (Students registered in Science or Engineering may not take this course for credit).
No prerequisites
3 lectures per week, Fall term
201* Contemporary Science 2
Similar discussions to those of Science 200*. (Science 200* need not be taken first.) Open to first year or upper year students. (Students registered in Science or Engineering may not take this course for credit.)
No prerequisites
3 lectures per week, Winter term

209* Scientific Literature and Writing
Information search and retrieval: libraries, scientific and technical literature, abstracts, sources of data, use of computers. Patents. The art of writing: scientific papers, technical reports, letters.
No prerequisites
2 lectures or discussion sessions per week, offered in Fall and Winter terms

210 Geology of the British Isles
Stratigraphy of the British Isles. Relationship of Geological structures and lithologies to land forms: geological factors influencing the distribution of extractive industries. The course will consist of two weeks of lectures, followed by a four week field excursion through Wales, Scotland, and England. The development of stratigraphic palaeontologic techniques will be demonstrated with visits to classical geologic exposures.
Prerequisite: Earth Sciences 130 or equivalent
Summer term only, 1.0 course credit

219* 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.
Prerequisite: at least one year of Secondary School Chemistry
2 lectures, Fall term

220* 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.)
Prerequisite: at least one year of Secondary School Chemistry
2 lectures, Winter term

237* Descriptive Astronomy
A survey course in astronomy intended for non-Science students (primarily Arts, Environmental Studies and Human Kinetics and Leisure Studies students). The solar system, stars, the galaxy, galaxies and the universe. Open to first year or upper year students (Students registered in Engineering, Mathematics or Science may not take this course for credit.)
No prerequisites
3 lectures per week, offered in Fall and Winter terms

238* Descriptive Astronomy
A survey course in astronomy intended for Mathematics, Engineering and Science students. The solar systems, stars, the galaxy, galaxies and the universe. Open to first year or upper year students. (Students whose major field is Physics may not take this course for credit.)
No prerequisite
3 lectures per week, offered in Fall, Winter and Spring terms

Note
Students interested in the above courses in Astronomy should note that because of overlapping material both courses may not be taken for credit — only the one most suitable to their background. Similarly students who have taken Physics 250* - The Solar System or Physics 251* - The Stellar System may not take the above courses in Astronomy for credit because of overlapping material.

249* Continents Adrift
A review of the current revolution in the Earth Sciences. This course will trace the evolution of the Earth as we know it today, primarily from the new viewpoint afforded by the hypothesis of seafloor spreading, plate tectonics and continental drift. Recent data from the moon and neighbouring planets will also be introduced.
(Students whose major field is Earth Sciences may not take this course for credit.)
No prerequisites
3 lectures, Winter term

250* 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 waste disposal with particular attention to solid waste (garbage) and deep well injection of liquid wastes.
Prerequisite: Students will find a course in Physical Geography or Earth Sciences to be an advantage
3 lectures, Winter term
251* Genetics and Evolution
The principles, methods and applications of genetics. The basis and implications of modern evolutionary theory. The modern approach and social implications will be discussed. Open to first year or upper year students. (Students whose major field is Biology may not take this course for credit.)
No prerequisites
3 lectures per week, Fall term

252* Biology and Society
A topical approach to problems of human society directly related to biological systems. Areas for discussion in any one year will be chosen from a wide range of topics. These will be dealt with both from the theoretical and practical aspects of modern biology. Open to first year or upper year students. (Students whose major field is Biology may not take this course for credit.)
No prerequisites
3 lectures per week, Winter term

260* Man and Vision
Elementary treatment of physical, physiological and psychological aspects of vision. Emphasis will be placed upon the visual environment and man. Selected phenomena in vision will also be covered. (Open to non-Optometry students only.)
No prerequisites
2 lectures per week, Fall term

270* 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.
Prerequisites: at least one year Secondary School Chemistry or Physics
3 lectures per week, Winter term

312* Physics of Music
A discussion of the nature of musical sounds and the function of the instruments that produce them. The mathematical basis of harmony, musical scales. Sound production by various instruments including the human voice; radiated power, sound spectrum. Acoustics of auditoriums; amplifier and speaker systems.
3 lectures, Fall term
Recommended for any students who understands logarithms and who is interested in both Music and Physics

313* Physics of Music
A continuation of Science 312* with greater use of mathematical models. Acoustics of simple sounds; sources, waves, resonance. The ear as a sound detector and analyzer. The analysis and synthesis of complex sounds. Electronic music, sound modifiers, organs and synthesizers. Acoustical impedance matching, loudspeaker enclosures, determination of the shapes of the wind instruments, acoustic radiation.
Prerequisites: Science 312*, Mathematics 31*, Physics 252* or equivalent or consent of instructor
3 lectures, Winter term
Recommended for students in the third and fourth years of Mathematics, Engineering or Science programmes

350* 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 Man-Environment 356*.)
(Students whose major field is Earth Sciences may not take this course for credit)
No prerequisites
3 lectures, Fall term

351* Human Biology 1
An approach to man as a "biological machine", and the effect of these changes on homeostasis. (Science 351* or 352* are not recommended to those students who have taken or are taking Biology 301, 303*, 304*, or 342. Not available to students who are Honours Biology or 4-year Biology majors.)
3 lectures, Fall term

352* Human Biology 2
Selected topics in human biology such as coordination of tissue function, metabolism, reproduction and the effects of harmful chemicals and drugs in common usage. (Science 351* or 352* are not recommended to those students who have taken or are taking Biology 301, 303*, 304*, or 342. Not available to students who are Honours Biology or 4-year Biology majors.)
3 lectures, Winter term
400 The History of Science
The development of scientific concepts from the Renais-
ssance to the early 20th century, Copernicus and
Galileo, Sir Isaac Newton. The physical and biological
sciences during the 18th century. Lavoiser. 19th
century developments in physics, chemistry, geology,
biology and technology. Evolution and the rise of
modern genetics. The 20th century revolution. Em-
phasis will be given to the reading of the works of
historically important scientists.
Prerequisites: The first year Science programme
(page 187) or equivalent
2 lectures per week, two terms, (Fall-Winter)
This course will normally be given every other year
(usually in odd years, e.g. 1975, 1977, etc.)

410* Technical Report (For Students in Co-op
Applied Chemistry, Co-op Applied Physics and
Co-op Earth Sciences only.)
Technical reports covering work term assignments are
submitted by all Co-op Science students. These will
be carefully evaluated for technical content and writ-
ing 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.

451* Our Biological Environment, The Land
A lecture course providing a study of the terrestrial
environment. Topics include: Physiological ecology
and adaptation; energy flow and material cycling,
succession; population biology; the major terrestrial
ecosystems; soils; conservation and pollution; methods
of pest control; human population and food supply.
(Students registered in Honours Biology programmes
may not take this course for credit.)
No prerequisites
Science 451* may not be taken for credit if credit
has been given for Environmental Studies 200*,
except by permission of instructor
3 lectures, Fall term

452* Our Biological Environment, The Water
A lecture course providing a study of freshwater and
marine environments with special reference to the
effects of modern man. Topics covered will include a
survey of the ecosystems and biota; nutrients and bi-
ological growth; eutrophication; biological aspects of
water supply and water pollution; pests and their
control; fish and fisheries problems; introduction to
oceanography. (Students registered in Honours Bi-
ology programmes may not take this course for
credit.)
No prerequisites
3 lectures, Winter term
Social Development Studies

Professor, Director of Programme
D.G.S. M'Timkulu, M.A.(South Africa), M.A.(Yale), Ph.D.(Natal) R

Professor
J.O. Towler, B.A.(Toronto), M.Ed.(Alberta), Ph.D. (Alberta) R

Assistant Professor
J. Forest, B.A.(Sir George Williams), Ed.D. (Massachusetts) R
H. Miller, B.Sc.(McGill), M.A.(Waterloo) R
M. Webber, B.A., M.S.W.(Dalhousie) R
M. Zentner, B.A.(Temple), M.S.W.(Kansas) R

Lecturer
C. Irizarry, B.A.(Wm. Smith College), M.S.W. (Columbia) (part-time) R

Associated Faculty
Assistant Professor, Religious Studies
M. Bird, B.A., M.A.(Iowa) R

Assistant Professor, Religious Studies
D. Bryant, B.A.(Concordia College), S.T.B. (Harvard), M.A.(Toronto) R

Adjunct Professor, Psychology
B.S. Francis, B.S.(Ursinus College), M.A., Ph.D. (Arizona) R

Assistant Professor, Geography
B. Hyma, B.Sc., M.Sc.(Madras), M.A.(Sheffield), Ph.D.(Pittsburgh)

Assistant Professor, History
W. Packhull, B.A.(Guelph), M.A.(Waterloo), Ph.D.(Queen's) R

Social Development Studies Programme

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

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

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

The Honours Programme

The honours programme consists of 8 academic terms in a period of 4 years. Courses are normally offered in the Fall or Winter terms. Requirements for the programme are 21 full credits including Faculty of Arts Group A and B requirements with an overall cumulative average of at least C- and a cumulative average of B in core area courses taken at Renison. These 21 credits should include a minimum of 9 full credits within the core area of the programme and a minimum of 4 full credits related to one of the multidisciplinary theme areas.

The General Program

The general programme consists of 6 academic terms in a period of 3 years. Courses are normally offered in the Fall or Winter terms. The programme requirements are listed below:
1) A minimum of 15 full courses in total;
2) The normal "Group A and B" requirements of the Faculty of Arts;
3) A minimum of 6 full courses from the core area courses listed below with the following stipulations:
a) A student is required to complete a minimum of 2 full courses from the list in each year that he/she is registered in the three year programme. In the first year a student must register in the fall term for the introductory courses (120 level) in sociology, psychology, social work and interdisciplinary social science. In the Winter term which follows it is recommended that the student completes follow-up courses (121 level) in at least 2 areas.
b) The six courses must be distributed over at least 3 of the 4 core areas with a maximum of 3 courses within a single area counting towards the requirement.

4) After meeting these minimum requirements, the student may elect his/her remaining courses from the general arts offering 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 Programme Director.

6) For further information consult the Registrar, Renison College, Waterloo, Ontario, N2L 3G4.

### Core Area Courses

#### Interdisciplinary Social Science

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<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisite</th>
<th>Term</th>
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<tbody>
<tr>
<td>ISS 120R*</td>
<td>Focal Issues in Contemporary Society</td>
<td>None</td>
<td>Fall/Winter</td>
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<tr>
<td>121R*</td>
<td>Focal Issues in Contemporary Society</td>
<td>ISS 120R* or consent of instructor</td>
<td>Winter</td>
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<tr>
<td>ISS 220R*</td>
<td>The History of Development of Modern Day Social Problems</td>
<td>ISS 120R* or consent of instructor</td>
<td>Fall</td>
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<tr>
<td>ISS 221R*</td>
<td>Community Issues</td>
<td>A social research course or consent of instructor</td>
<td>Winter</td>
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<tr>
<td>ISS 250R*</td>
<td>Social Research</td>
<td>second year standing or consent of instructor</td>
<td>Winter</td>
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<td>251R*</td>
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<tr>
<td>ISS 320R*</td>
<td>Social Research</td>
<td>ISS 327R* or consent of instructor</td>
<td>Winter</td>
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<td>321R*</td>
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<tr>
<td>ISS 367R*</td>
<td>Social Research</td>
<td>ISS 398R* or consent of instructor</td>
<td>Winter</td>
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<td>369R*</td>
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<td>ISS 469R</td>
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<td>ISS 499R</td>
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</table>
ISS 320R* Critical Encounter With the Study of Man
An attempt to develop a critical sense of the relevance of the social sciences to man. Focus on questions cutting across several disciplines. Special attention to men, theories and methodologies at the “cutting edge” of the social sciences, with emphasis on those taking an interdisciplinary approach.
Prerequisite: Courses in at least two of the social sciences or consent of instructor
Fall/Winter terms

ISS 367R/-369R* Special Topics in Interdisciplinary Social Science
One or more half courses of an interdisciplinary nature will be offered from time to time as announced by the Social Development Studies Programme. Subjects will be dependent upon special research and/or instructional interests of faculty.

ISS 367R* Education as a Social Problem
A look at how our educational institutions are reflective of selected social problems. A consideration of the relationship between education and the place of the individual within society. The significance of education and social processes for the study of selected issues in social work.
Prerequisite: second year standing or consent of instructor
Fall term

ISS 368R* Work as a Social Problem
A look at how our educational institutions are reflective of selected social problems. A consideration of the relationship between education and the place of the individual within society. The significance of education and social processes for the study of selected issues in social work.
Prerequisite: second year standing or consent of the instructor
Winter term

ISS 369R* Game Simulation of Social Processes
Simulation will be examined as both a teaching device and a research tool in the social sciences. Games with simulated environments will be employed to study interpersonal interaction and social processes. These games will focus on social control, bargaining, stratification, socialization, power, etc. Subsequent to examination of theory, students will be asked to develop simulation exercises of their own.
Prerequisite: Second year standing or consent of the instructor
Fall term

ISS 398R*-399R* Independent Study
An independent in-depth study with an interdisciplinary focus on a selected area of concern to the student. This course may be undertaken by an individual or small group of students with one of the faculty members from the Social Development Studies Programme.

ISS 469R* Senior Seminar Workshop
Social and human phenomena will be examined holistically. Students will be encouraged to synthesize knowledge learned in other social science courses in an intensive study of specific social issues and human concerns. The issues examined will vary from year to year reflecting social change, immediate community concerns, developments in the social sciences and the interests of students and instructors. Students will be required to engage in field projects, including community based learning experiences.
Prerequisite: Open to senior honours students only
Year course

ISS 499R Senior Honours Essay
The essay will normally be related to the student's chosen theme area. Although the work will be supervised by only one faculty member, the final product will be critically examined by faculty from all areas of the programme.
Prerequisite: Open to senior honours students only
Year course
Psychology

Psych 120R*/121R* Introductory Psychology
Basic concepts and techniques of modern psychology as a behavioural science, with special emphasis on social aspects of behaviour. 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 and environmental factors.

Prerequisite: none
Fall/Winter terms

Psych 220R*/221R* Social Psychology
An examination of psychological principles involved in the interaction of individual and society. Emphasis on social attraction, socialization of the child, language and social communication, interpersonal perception, attitude formation, personality and society, status and roles, social control, group dynamics and leadership.

Prerequisite: introductory psychology course
Fall/Winter terms

Psych 322R*/323R* Social Functioning and Human Behaviour
Relationships between models of the nature of the human being and societal structures. Psycho-analytic, existential, behaviouristic and humanistic models will be examined. Contrasts of views of abnormal behaviour as human experiencing, personality disorder, social problems, and a manifestation of culture. A brief summary of treatment procedures with social emphasis on community-based approaches to treatment and prevention.

(Cross-listed with Psych 355*/357*)
Prerequisite: introductory psychology course
Fall/Winter terms

Psych 334*(R) Theories of Counselling Psychology
An introduction to the theories, methods and problems in Counselling Psychology.

Prerequisite: Introductory psychology course
Fall term

Psych 367R*-369R* 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 367R* Fantasy Processes
An examination of the role of fantasy in the normally functioning human being. Aspects of human experiencing will be explored in which fantasy processes are basic and essential (e.g. dreaming, daydreaming, play, creativity, aesthetic sensitivity). Therapeutic applications of fantasy approaches will be explored partially through experiential involvement.

Prerequisite: Introductory psychology course
Winter term

Psych 368R* Social Psychology of Men
The emergence of the women's movement has provoked and threatened many men, producing anger, bitterness, confusion and guilt. Yet a perplexing question has been raised: what does it mean "to be a man" in our society? What should it mean? In an attempt to answer these questions the course will examine socialization and development, affiliation and emotional expressiveness, power and violence, fatherhood, work, sexuality, marriage.

Prerequisite: introductory psychology course
Winter term

Psych 398R*-399R* Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of psychology. This course may be undertaken by an individual or small group of students with one of the faculty members from the Social Development Studies Programme.

Note
Renison also expects to be able to offer the following Psychology courses: Psych 241 (R) Educational Psychology; Psych 242 (R) Special Education; and a course in Early Childhood Education (as yet unnumbered).
Sociology

Soc 120R*/121R* Fundamentals of Sociology
An examination of the fundamental concepts of sociology and their application in seeking to understand the changing patterns and life styles taking place specifically in Canada, and in general, within North American society. Patterns of deviance, social stratification, minority adaptation, and changing patterns in organization, family, political process, and religious observance will be examined.
Prerequisite: none
Fall/Winter terms

Soc 220R* Sociological Analysis
An application of sociological analysis to the study of various institutions such as education, religion and the law. Development of an approach or methodological perspective which can be applied to the study of other social phenomena.
Prerequisite: introductory sociology course
Fall term

Soc 221R* Master Trends in Modern Society
Introduction to the major problems of urban, industrial, and political sociology studied within a framework emphasizing social change. Illustrations will be drawn from emergent as well as advanced societies.
Prerequisite: introductory sociology course
Winter term

Soc 225R* 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.
Prerequisite: introductory sociology course or consent of instructor
Fall term

Soc 226R* Race and Culture in the Third World 2
Problems of acculturation and intergroup relations in plural societies in selected areas in the Caribbean, South and Southeast Asia, East and Southern Africa.
Prerequisite: Soc. 225R* or consent of instructor
Winter term

Soc 325R*/326R* 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.
Prerequisite: introductory sociology or consent of instructor
Fall/Winter terms

Soc 327R*/328R* 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 Canadian mosaic. In 1975-76 North American Indians will constitute a central focus of analysis.
Prerequisite: introductory sociology
Fall/Winter terms

Soc 367R*/369R* Special Topics in Sociology
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.

Soc 398R*-399R* Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of sociology. This course may be undertaken by an individual or small group of students with one of the faculty members from the Social Development Studies Programme.
Social Work

Soc Wk 120R* 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.
Prerequisite: none
Fall term

Soc Wk 121R* 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.
Prerequisite: none
Winter term

Soc Wk 220R* 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.
Prerequisite: Soc Wk 120R* or consent of instructor
Fall term

Soc Wk 221R* 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.
Prerequisite: Soc Wk 120R* or consent of instructor
Fall term

Soc Wk 222R* Community Organization
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.
Prerequisite: Soc Wk 120R* or consent of instructor
Fall term

Soc Wk 320R* Social Casework 2
An examination of some of the more complex intellectual components of the social work skills necessary to work with individuals in casework. Social work theories of the individual will be examined in order for the student to learn some clinical applications relevant to the casework relationship. Emphasis on methodology.
Prerequisite: Soc Wk 220R*, or consent of instructor
Winter term

Soc Wk 321R* Social Work and Family Therapy 2
An examination of some of the more complex intellectual components of some of the social work skill 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 relevant to social work with groups and families. Emphasis on methodology.
Prerequisite: Soc Wk 221R*, or consent of instructor
Winter term

Soc Wk 322R* Community Organization 2
An examination of social change tactics and strategies as they have been operationalized by individuals and groups committed to the social work ethos. This course will concentrate on the Canadian scene and examine such diverse formations as social work unions, collective action by welfare recipients, political parties, etc. The purpose of this course is to investigate appropriate avenues of social work intervention in the process of change as it affects functional and geographic communities.
Prerequisite: Soc Wk 222R*, or consent of instructor
Winter term

Soc Wk 326R* 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.
Prerequisite: Soc. Wk 120R*, or consent of instructor
Winter term

Soc Wk 367R*-369R* Special Topics in Social Work
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.
Soc Wk 368R* Human Sexuality and Social Work
Content will focus on the sex research of Kinsey, Masters and Johnson, and will examine areas of importance for social work theory and practice. Current sexual myths and popular literature supporting the myths will be explored. The social worker's role in changing individual societal attitudes and sanctions regarding sexual behaviour will be examined.
Prerequisite: Soc Wk 120R*, or consent of instructor
Winter term

Soc Wk 369R* Women and Social Work
An examination of the evolution of women's problems in contemporary society with emphasis on the implications for social work theory and practice. Attention will be given to those women who are frequent recipients of social services: poor women, single mothers, welfare recipients, women prisoners and others, and to the role of women in the profession of social work.
Prerequisite: Soc. Wk 170R* or consent of instructor
Fall term

Soc Wk 398R*-399R* Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of social work. This course may be undertaken by an individual or small group of students with one of the faculty members from the Social Development Studies Programme

Elective Courses
The following elective courses are administered by Revison College. For fuller descriptions, see appropriate departments.

Arts
220R* Chinese Thought and Culture 1
221R* Chinese Thought and Culture 2
250R Art and Society
320R*325R* Special Topics in Chinese Thought and Culture

English
109Z* (R) Basic Writing Skills
140R*/141R* The Use of English, 1 and 2
205R* The Canadian Short Story
245R Form and Function
376R*/377R* Our Changing Language: Syntax and Semantics, 1 and 2
385R Twentieth Century Literature

Fine Arts
246R*/247R* Religion and the Film, 1 and 2
346R* The Film in Canada
347R* Film and Culture in India

Geography
125R* Introduction to the Developing World
126R* The Emerging "Third World"
225R* Urbanization in Newly Developing Countries
226R* Population Growth and Resource Development in "Third World" Countries

History
101R*/102R* Major Themes of Western Civilization, 1 and 2
269R A History of Modern Revolutions
367R*/369R* A History of War, 1 and 2

Philosophy
100R Introduction to Philosophy

Religious Studies
160R*/161R* Religion and Culture, 1 and 2
262R*/263R* Religion and Politics, 1 and 2
266R*/267R* Religion and the Film, 1 and 2
298R*/299R* Directed Readings in Special Subjects
332R* Fantasy
360R*/361R* Sacred and Profane in the Arts, 1 and 2
366R*/367R* Religion and Contemporary Literature, 1 and 2
460R*-463R* Special Topics in Religion and Culture
Department of Sociology and Anthropology

Sociology

Assistant Professor, Chairman
J.E. Curtis, B.A. (Sir George Williams), M.A. Central Michigan, M.A. (Cornell)

Professors
G.L. DeGré, B.S.S. (City College, N.Y.), M.A., Ph.D. (Columbia), Cated Hon. (San Marcos, Lima)
H.J. Fallding, B.A., B.Sc., M.A. (Sydney), Ph.D. (Australian National)
H.D. Kirk, B.S. (City College, N.Y.), M.A., Ph.D. (Cornell)
D. Smucker, B.A. (Bluffton), B.D. (Princeton), M.A., Ph.D. (Chicago) G

Visiting Professor 1973-74

Associate Professors
M.A. Beauchamp, B.A., M.A. (Buffalo)
E.A. Fasick, B.A. (Penn. State), M.A., Ph.D. (Columbia)
D. Kubat, M.A. (Kansas), Ph.D. (L. Maximillan, Munich)
R.D. Lambert, B.A., M.A. (McMaster), Ph.D. (Michigan)
D.G.S. M'Timkulu, M.A. (S. Africa), M.A. (Yale), Ph.D. (Natal) R
W.G. Scott, B.A. (Western), M.A. (Toronto)
E.W. Vaz, B.A., M.A. (McGill), Ph.D. (Indiana)
A. Wipper, B.A., M.A. (McGill), Ph.D. (California, Berkeley)

Assistant Professors
J.M. Alleyne, B.A. (Sir George Williams), Ph.D. (Johannes Gutenberg) J
J. Curtis, B.A. (Sir George Williams), M.A. (Central Michigan), M.A. (Cornell)
M. Eichler, M.A., Ph.D. (Duke)
L. Fischer, B.A. (Rutgers), M.A. (Northwestern), Ph.D. (Duke)
J. Goyder, B.A. (Bishop's), M.A., Ph.D. (McMaster)
A.Q. Lodhi, M.A. (Punjab), M.A., Ph.D. (Toronto)

Lecturer
B. Leathers, B.A., M.A. (Carleton)

Associated Faculty

Professor, Human Relations
J.M. Butler, B.Sc., Ph.D. (Minnesota)

Professor, Statistics
W.F. Forbes, Ph.D., D.Sc. (London), D.I.C.

Associate Professor, History
L.A. Johnson, B.A. (Waterloo), M.A., M.Phil. (Toronto)

Professor, Kinesiology

Professor, Psychology and Human Relations
M. Lerner, B.A., M.A. (Ohio State), Ph.D. (N.Y.U.)

Assistant Professor, Kinesiology
B. McPherson, B.A., M.A. (Western Ontario), Ph.D. (Wisconsin)

Adjunct Faculty

Associate Professor, Sociology and Anthropology, Wilfred Laurier Univ.
G.M. Anderson, B.A., M.A. (McMaster), P.D. (Toronto)

Undergraduate Course Descriptions

Note 1
General Students who major in Sociology must elect the following courses: Sociology 101*, a half course in sociological methods, a half course in sociological theory, and three and one half full courses (or equivalent half courses) in Sociology. Students are strongly encouraged to elect Sociology 202*, although this is not required.

Note 2
An Honours programme in Sociology is a pre-professional degree, so the specific requirements have been formulated in the light of professional and graduate school requirements. Students are reminded that Sociology is now accepted as a high school teaching subject in Ontario. Potential high school teachers should keep informed of the requirements for teaching Sociology in high schools. Students may elect Honours Sociology (Canadian Studies) by fulfilling the requirements listed under Canadian Studies in this calendar.
Note 3
The student is reminded that an Honours or a major programme in Sociology is intended to provide a liberal arts education. Students are encouraged to avoid excessive concentration in Sociology, and to elect courses in a variety of social sciences, humanities, modern languages, as well as in other Faculties.

Note 4
First year students who are interested in Sociology as a major are encouraged to take courses in other Social Science such as Anthropology 101*, 102*, Political Science 115*, and Psychology 101*.

101* Introduction to Sociology
An introduction to the basic concepts and frames of reference of sociological investigation and interpretation. Topics for analysis will include communities, associations and institutions, classes and status groups, crowds and publics, social processes, and social change. Special attention is given to Canadian society.
Not open to students who have taken Soc. 141*, 101(f)* or 101(m)*
2 lectures, Fall and Winter terms

101(f)* The Sociological Enterprise
Not open to students who have taken Soc. 101*
Not offered 1975-76

101(m)* Introduction to Formal Sociology
An introduction to the fundamentals of sociology using examples from mathematical sociology. While students will be responsible for the core material covered in Sociology 101 the emphasis will be on experiments in and simulation of social processes. The course will consider several modelling efforts in the areas of three person games, spontaneous group formation, organizational complexity, diffusion of innovation, and stable population theory.
The course is intended as an elective for mathematics students or as a basis for a combined honours in mathematics and sociology.
2 lectures and lab, Fall term

202* Sociological Statistics
A first course in sociological statistics; sampling, central tendency, probability, co-variance, as illustrated in specifically sociological data.
Prerequisite: Soc. 101*, or equivalent other introductory social science course
2 hours lecture, 2 hours lab, Fall term

203* Introduction to Comparative Social Thought
Lectures, readings and discussion of selected original sources both Eastern and Western which attempt to define and evaluate the relation of the individual to society, and society to nature and cosmos, as expressed in classical as well as in later documents. Topics will include the mythological world-view; the emergence of an ordered social cosmos in Greece, the Middle East and China; and the response to these issues in the social thought of Europe.
No prerequisite
2 hours, Winter term

205* Sociological Analysis of Social Problems
An examination of cultural forces that create social problems and failures in personal and institutional adjustments. Specific attention is paid to the problems of emotional disturbance, poverty, delinquency and industrial disruptions in Canadian society.
No prerequisite
2 lectures, Fall and Winter terms

208* Elementary Problems in (non-participant) Field Observation
Not offered 1975-76

209* Advanced Problems in (non-participant) Field Observation
Not offered 1975-76

210* Introductory Social Psychology
Basic concepts in the interdisciplinary field of social psychology; approached from the perspectives of social influence. Individualistic, interpersonal, and group-based strategies for influencing the behaviour of others are examined.
Prerequisite: Soc. 101* or Psych. 101*
3 hours, Winter term

211* Social Structure and Character
In the context of comparative studies of slavery in the Americas this course examines the relationship between social institutions and types of human personality or "Social Identity".
Prerequisite: Sociology 101*
2 hours, Winter term

215* Sociology of Sex Roles
A comparative analysis of women's roles in past and present with selected cross-cultural data. Assessment of the present situation, especially sex role socialization and the impact of sex roles on the family and the economy. A discussion of the women's liberation movement is included.
Prerequisite: Soc. 101*
2 hours of lecture, 1 hour of discussion, Fall and Winter terms
218* 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 adolescent’s social roles to processes of social change and stability.
Prerequisite: Soc. 101*
2 lectures, Winter term

240* Collective Behaviour
The sociological analysis of the behaviour of crowds, mobs, publics and related phenomena and their relationships to social organization and social change.
Prerequisite: Soc. 101*
2 lectures, Winter term

241* Social Movements
The sociological analysis of varieties of social movements and their relationships to social organization and social change.
Prerequisite: Soc. 101*
2 lectures, Fall term

250* Crime and Society
An analysis and criticism of the major theories of criminal behaviour. Emphasis is given to the relationship between social structure and criminal behaviour; types of criminal behaviour such as drug addiction; statistics and contemporary research. Special attention is given to Canadian data. A sound knowledge of sociological concepts is advisable.
Prerequisite: Soc. 101*
2 lectures, Fall term

251* Ethnic and Racial Relations
Relations between different racial and cultural groups: analysis of majority-minority group status with special reference to Canada.
Prerequisite: Soc. 101*
2 lectures, Winter term

252* 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.
Prerequisite: Soc. 101*
3 lectures, Fall and Winter terms

261* Population Issues
The study of population as an area of sociological investigation; population size, composition, and distribution; population trends and problems.
No prerequisites
Not offered 1975-76

262* Canadian Population
Study of the basic demographic processes in the population of Canada. Demographic implications for selected social institutions. Use of Canadian enumeration and registration data.
No prerequisites

265* Social Structure of East Asia: China and Japan
Not offered 1975-76

270* 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.
Prerequisite: Soc. 101*
2 lectures, Fall term

280* Social Organization of Animal Societies
The social behaviour of various species of animals will be examined and compared. The main emphasis will be on exploring the nature of social behaviour and gaining further understanding of human societies by comparing them with others.
Prerequisite: Soc. 101*
2 lectures, Fall term

300* Canadian Social Institutions
General theoretical and methodological issues in the study of social institutions and Canadian substantive examples in comparative perspective. Special attention is paid to such social institutions as the economy, polity, stratification and the family and to institutional interrelations. How are institutions linked? What is exchanged between institutions? What are the origins and character of institutions and how do they undergo change? Extensive readings from the Canadian literature.
Prerequisite: Soc. 101*

301* Urban Sociology
The comparative study of urbanization as a process; the culture and social organization of cities, urban problems; special attention is given to industrial cities of Canada, with comparative reference to the principal industrial cities of Western societies.
Prerequisite: Soc. 101*
2 lectures, Fall term
303* Crises in Social Structure and Character
This course proposes a frame of reference for the systematic study of human predicaments, ranging in scope from illness and dying to natural disasters and socially induced calamities like forced migration, total war, and genocide.
Prerequisite: Sociology 101*
2 hours, Fall term

304* Crisis Management
Some crises of social structure, such as disease, death, and poverty, are so pervasive as to call forth universally equivalent mechanisms of coping. This course explores such institutionalized mechanisms as medical and welfare services in the context of Weber's types of authority and of rationality.
Prerequisite: Sociology 303* or permission of the instructor
2 hours, Winter term

308* Elementary Problems in (participant) Field Observation
Not offered 1975-76

309* Advanced Problems in (participant) Field Observation
Not offered 1975-76

310* Seminar in Group Dynamics
An analysis of natural and experimental groups from a social structural view. The study of processes of differentiation, integration, power, etc., internally; and of nesting of small groups in larger collectives.
Prerequisite: 3rd or 4th year standing in a social science or by permission
2 hours seminar, Fall term

315* Social Stratification
Analysis of social classes in society including their basis for development, composition, and consequences for society. Special attention is given to social stratification in Canada.
Prerequisite: Soc. 101*
3 hours, Winter term

321* Research Methods 1
A systematic treatment of the logic and practice of methods basic to social research. Emphasis is on problems of research design based on the analysis of case studies. Special attention is given to problems of participant observation, use of available data, measurement of variables, and simple multivariate analysis. Students will be given experience in several techniques of research. Special attention is given to Canadian cases and data.
Prerequisite: Soc. 101* or equivalent other introductory social science course
2 lectures, 1 hour lab., Fall term

316* Family Structures in Comparative Perspective
Family structures in a number of different societies will be compared. The impact of specific structures on individual family members and the relationships between such structures and other social institutions will be analyzed. Changes occurring in the predominant family structure in North America will be considered.
Prerequisite: Soc. 101*
2 lectures, Fall term

322* Research Methods 2
Continuation of Research Methods 1. Includes an introduction to sampling, scaling, the analysis of change, and experimental design. Students will be asked to construct a research design for the study of a theoretically relevant problem in sociology.
Prerequisite: Sociology 321*
2 lectures, 1 hour lab., Winter term

323* Projects in Sociological Research
Introduction to sociological research through the formation of a theoretically based research objective and its implementation in a small scale team research project. Students must be willing to participate in team research with 6-8 other students. Readings are assigned that relate to the steps in the team project. The course grade is based on each team's final project report and on a final examination covering the readings.
Prerequisite: Soc. 101*
2 hours seminar, Winter term

324* Field Research in Canadian Institutions
Not offered 1975-76

330* Comparative Social Structure
Not offered 1975-76

331* Theories of Social Change
A systematic review and analysis of major theories of social change including some of the classical and modern theories. Analysis will focus upon the sources, patterns, processes and consequences of change. Special topics to be included are: Marxism, social change in developing countries, the role of ideas, and the breakdown and reorganization of social structure.
Prerequisite: Soc. 101*
2 lectures, Winter term
332* Social Conflict and Modernization
This course constitutes a sociological study of violent and non-violent conflict and modernization in comparative perspective. A critical review of the selected theoretical explanations of collective protest and social change will be done to discover linkage between social conflict and modernization. An attempt will be made to examine causes and consequences of racial and political violence in modernizing society.
Prerequisite: Soc. 101*
2 lectures, Winter term

334* Northern Lands and Peoples
Not offered 1975-76

325* Sociology of Science
The study of science as an institution; its historical development and contemporary relationship with other institutions including government, education, and industry.
Prerequisite: Soc. 101*
3 lectures, Winter term

338* Sociology of Literature
Not offered 1975-76

339* Industrial Sociology
Sociological analysis of industry, including relationships between labour and management and industry and society.
Prerequisites: Soc. 101*
2 lectures, Winter term

340* Formal Organizations
A survey of theory and research on formal organizations making use of selected contributions from the scientific management and human relations approach, but with emphasis on the structure and functions of large scale organizations. The nature and types of formal organizations; control techniques and leadership; relations of the organization to its clients and publics; informal aspects of the organization; organizational tensions and pathologies of bureaucratic systems; how the organization adjusts to change.
Prerequisite: Soc. 101*
2 hours seminar, Fall term

341* Occupational Sociology
An introduction to the study of work and occupations; the problems of occupational choice, occupational socialization and identification; the concept of careers and career mobility, the professionalization process, the nature of professions; the impact of occupation on life styles, leisure and retirement.
Prerequisites: A 100 level sociology course. Soc. 342 is recommended as complementary
2 hours, Winter term

342* Social Structure of the Canadian Labour Force
An examination of the social factors which account for the deviation of the structure and functioning of the Canadian labour market from the “pure” economic market model. Topics will include: the changing occupational structure; sex based differences in occupation and participation; ethnic factors in occupations; the impact of large corporations and unions on labour market functioning; the role of national and international mobility in labour allocation; the labour market and social mobility. Some background in economics and/or demography is desirable but not essential.
Prerequisite: A 100 level sociology course. Soc. 341 is seen as complementary to 342 but is not a prerequisite.
2 hours. Winter term

350* Seminar in Socialization Processes
Not offered 1975-76

355* 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, ethic, and religious experience. Much religious diversity is explained, for example, the diversity due to sectarian and ecumenical movements, to divergent views of salvation, and to secularization.
Prerequisite: Soc. 101*
2 lectures, Fall term

361* Conflict Simulation Workshop
Comparative studies in social and political conflict: war, colonialism, insurgency, class struggles etc., utilizing conflict simulation games for testing basic concepts. Readings in the sociology of conflict, as well as case studies in the application of game concepts will supplement the practicum.
Prerequisite: Soc. 101*
2 hours, Fall term

365* Social Structure of the Soviet Union
Not offered 1975-76

371* 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*)
Prerequisite: Some previous work in a Social Science or in Philosophy
3 hours
372* Medical Sociology
Examination of the medical care structures from the point of view of patients, health care professionals in the system, and systems analysis. Structures of interest are primary health care settings, hospitals, and professional associations. Emphasis on cross-cultural comparisons and changes over time as well as critical analysis of current structure from the point of view of the Canadian health care consumer.
Prerequisite: Soc. 101*
2 lectures, Winter term

373* 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 analysed. Special emphasis will be given to the problem of leisure time in the later years of life.
(Same as Kinesiology 352* and Recreation 361*)
Prerequisite: Sociology 101* and one other sociology course
3 lectures, Fall term

374* 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 Recreation 303* and Kinesiology 452*)
Prerequisite: Sociology 101* and one other Sociology course
3 lectures, Winter and Spring terms

375* 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 Recreation 301*)
Prerequisite: Two term courses in Sociology, i.e. Sociology 101* and 341 *
3 lectures, Winter term

382* Techniques of Demographic Analysis
Introduction to the standard techniques of analysis of enumeration and registration data.
Prerequisite: Soc. 261*

399* Research Seminar in Canadian Society
A research oriented seminar dealing with selected topics in Canadian society and cross-national comparisons. Each student will select a research problem and collect and analyze fresh data or subject existing data to secondary analysis. Students should be willing to acquire the necessary research skills, such as processing data with SPSS.
Prerequisite: Registration in 3rd or 4th year of social science honours programme
3 hours seminar, Fall term

398* Seminar in Nationalism and Ideology in Canada and Québec
A research oriented seminar dealing with varieties of nationalism, national identity, separatism, independence and political/economic ideology and values in Canada and Québec.
Prerequisite: Registration in 3rd or 4th year of an honours programme
3 hours seminar, Winter term

400 Processes of Planned Change
Not offered 1975-76

402* Marxist Social Theory
Not offered 1975-76

410* Seminar in Self and Social Interaction
Not offered 1975-76

415* Seminar on the Impact of Sex Factors on Sociological Theory and Research
An examination of selected areas of contemporary sociological theory with respect to their treatment of women and men.
Prerequisite: Soc. 215 and 3rd or 4th year standing in social science or permission of the instructor
2 hours seminar

421* Secondary Analysis of Survey Data
Not offered 1975-76

425* 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.
Prerequisite: Open only to students in Sociology
2 lectures, Fall term

426* Contemporary Sociological Theory
The development of sociological theory in the 20th century. Included is discussion of current theoretical work.
Prerequisite: Open only to students in Sociology
2 lectures, Winter term
432* The Sociology of Political Knowledge
This seminar will undertake to develop a general theory of the sociological roots and implications of political thought in relation to contemporary social movements and ideologies in historical perspective. Comparative illustrative materials will be drawn from Latin America, Europe, Africa and/or Asia, which will also serve as a basis for research papers.
Prerequisite: any 1 of the following Soc. 241*, 331*, 360*, 425* and Honours Soc. and/or Political Science or graduate standing
2 hours seminar; Winter term

451* Seminar: Problems in Contemporary Theory and Research
Not offered 1975-76

466* Reading 1
Selected readings and essay assignments under the direction of a faculty member.
Prerequisite: 3rd or 4th year standing in Sociology and permission of the instructor
Fall term

467* Reading 2
Selected readings and essay assignments under the direction of a faculty member.
Prerequisite: 3rd or 4th year standing in Sociology and permission of the instructor
Winter term

470* Seminar: Practicum in Theory and Methodology
Not offered 1975-76

480* Advanced Social Statistics
Multiple and partial correlation; regression; analysis of variance and covariance; selected non-parametric techniques.
Prerequisite: Sociology 202* or equivalent
2 lectures, 1 hour lab, Fall term

481* Mathematical Sociology
Selected mathematical techniques with applications to sociology; sets and graphs, Markov chains and game theory.
Prerequisite: Permission of instructor
2 lectures, Winter term

499 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.
Prerequisite: 4th year Sociology Honours

The following courses are administered by Conrad Grebel College

207G* Educational Sociology
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.
Prerequisite: Soc. 101
3 hours, Fall and Winter terms

230G* Family and Kinship
An evaluation of the origin and growth of the family as a social institution; its structures and functions in primitive and modern societies; the effect of modern technology on the family, trends and contemporary problems.
Prerequisite: an introductory social science course
3 hours, Winter term

275G* The Mennonites as a Sociological Community
A case study of the Waterloo County Mennonites as a social system. Attention is paid to a methodology for studying a religious-cultural group by engaging in direct field studies. The community's charter resources, integration, family system, life ceremonies, adaption to change, and survival techniques will be examined.
Prerequisite: an introductory social science course
3 hours, Fall term

290G 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.
Prerequisite: an introductory social science course
3 hours, Winter term

307G* 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.
Prerequisite: Soc. 101 and 207G*
3 hours, Winter term
370G* 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.
Prerequisite: third year standing in a social science course or by permission
3 hours, Fall term

377G* Seminar: Studies in Sociology of the Mennonites
This seminar will devote attention to research methods, sociological theory and interdisciplinary approaches to the study of Mennonite communities and culture.
Prerequisite: Permission of the instructor

The following courses are administered by Renison College

Soc 120R*/121R* Fundamentals of Sociology
An examination of the fundamental concepts of sociology and their application in seeking to understand the changing patterns and life styles taking place specifically in Canada, and in general, within North American society. Patterns of deviance, social stratification, minority adaptation, and changing patterns in organization, family, political process, and religious observance will be examined.
Prerequisite: none
Fall/Winter terms

Soc 220R* Sociological Analysis
An application of sociological analysis to the study of various institutions such as education, religion and the law.
Development of an approach or methodological perspective which can be applied to the study of other social phenomena.
Prerequisite: introductory sociology course
Fall term

Soc 221R* Master Trends in Modern Society
Introduction to the major problems of urban, industrial, and political sociology studied within a framework emphasizing social change. Illustrations will be drawn from emergent as well as advanced societies.
Prerequisite: introductory sociology course
Winter term

Soc 225R* 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.
Prerequisite: Introductory sociology course or consent of instructor
Fall term

Soc 226R* Race and Culture in the Third World 2
Problems of acculturation and intergroup relations in plural societies in selected areas in the Caribbean, South and Southeast Asia, East and Southern Africa.
Prerequisite: Soc. 225R* or consent of instructor
Winter term
Soc 325R*/326R* 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.
Prerequisite: introductory sociology or consent of instructor
Fall/Winter terms

Soc 327R*/328R* 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 Canadian mosaic. In 1975-76 North American Indians will constitute a central focus of analysis.
Prerequisite: introductory sociology
Fall / Winter terms

Soc 367R*/369R* Special Topics in Sociology
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.

Soc 398R*-399R* Independent Study
An independent in-depth study of a selected area of concern to the student within the discipline of sociology. This course may be undertaken by an individual or small group of students with one of the faculty members from the Social Development Studies Programme.
Anthropology

Associate Professor
T.S. Abler, B.A.(Northwestern), M.S.(Wisconsin-Milwaukee), Ph.D.(Toronto)
Wm.B. Roosa, B.A.(Texas Christian), M.A.(New Mexico), Ph.D.(Michigan)
S.M. Weaver,1 B.A., M.A., Ph.D.(Toronto)

Assistant Professors
D.E. Counts, B.S.(S.W. Texas State College), M.A. (Kentucky), Ph.D.(Southern Illinois)
C.E. De'ath,2 B.A.(Auckland), ASOPA Cert.(Sydney), M.Ed., Ph.D.(Pittsburgh)
S. Gabow, B.A.(California – Berkeley), Ph.D. (Toronto)
J. Rogers, B.A.(Radcliffe), M.A.(New Mexico), Ph.D. (Toronto)
J.G.E. Smith, Ph.B., M.A., Ph.D.(Chicago)

Faculty members holding cross appointments as shown
1 Anthropology and Urban Regional Planning
2 Anthropology and Man-Environment Studies

Undergraduate Course Descriptions

Note 1
Anthropology degree requirements are currently under revision. Students are strongly advised to consult the department before planning a programme in order that they may take the new requirements into account.

Note 2
Many of the listed courses are given irregularly. Students should consult the course offerings list issued at preregistration.

101* Origins of Man and Culture
An introductory course in 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.
3 hours lecture, Fall term

102* Cultural and Social Anthropology
An introductory course on the nature of culture. Data is presented on several primitive cultures.
3 hours lecture, Winter term

103 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.

201* Principles of Archaeology
An introduction to the working assumptions analytic approaches and integrative and descriptive methods of archaeological anthropology.
Offered annually
3 hours lecture
Recommended to Honours Anthropology students
No prerequisite

202* Principles of Social Organization
An introduction to basic concepts used by social anthropologists for the analysis of social, economic, political and ideational systems.
Offered annually
3 hours lecture
Recommended to Honours Anthropology Students
Prerequisite: 102* or permission of instructor
210* Anthropology of Religion
An introduction to the study of the beliefs and practices of primitive peoples about the world of nature and of man. The course will deal with the religious and related systems of selected primitive peoples. Readings will reflect these accounts in the ethnographic literature.
Prerequisites: 102 or permission of instructor

218* A Survey of North American Archaeology
Paleo-Indian and Archaic
This course deals with the earliest known cultures in North America (mostly prior to 1000 B.C.).
3 hours lecture
No prerequisites
Not acceptable for Honours Credit

220* Old World Prehistory, The Food Procuring Phases
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 nonagriculture peoples of recent times.
Prerequisites: 101 or permission of the instructor
3 hours lecture
Not acceptable for Honours Anthropology credit

221* Old World Prehistory, The Food Producing Phases
Examination of the transition to an economy based on food production, the spread of food producing economies, the rise of civilization in the Near East to the early literate periods. Consideration of later prehistoric developments in Africa, Asia and Europe.
Prerequisites: 101 or permission of the instructor
3 hours lecture
Not acceptable for Honours Anthropology credit

224* A Survey of Southwestern Archaeology
The origins and development of food-producing cultures in the American Southwest.
3 hours lecture
No prerequisites
Not acceptable for Honours Anthropology credit

226* A Survey of Great Lakes Archaeology
A Survey of the cultures in the Great Lakes area, with emphasis on the period from ca. 1000 B.C. to 1500 A.D.
3 hours lecture
No prerequisite
Not acceptable for Honours Anthropology credit

227* Peoples of Africa
A survey of the cultures and societies of the sub-Saharan Africa. An emphasis will be placed upon the ethnographic present.
Prerequisite: 102 or permission of the instructor

228* Peoples of the Pacific
A comparative ethnological survey of selected indigenous societies in the Pacific region.
3 hours lecture
Prerequisites: 102 or permission of the instructor

229 Cultures of West Africa
An examination of cultural developments in Western Africa, focusing on the Sahel, Savannah, and Forest Zones.

230* (Art 216*) Primitive Art
A study of Paleolithic, Mesolithic and Neolithic world art, aspects of Bronze Age Europe, Asia and the Near East, the art of the African continent, the North and South American Indians in pre-Columbian and colonial times, and Australian-Oceania, together with related fields such as folk art, native and child art.
3 hours lecture

233* 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.
3 hours lecture
Prerequisites: 102 or permission of the instructor

234 North American Indians
A survey of the cultures of the native peoples of Canada and the United States at the time of contact with European Civilization. Emphasis will be placed upon such aspects as cultural ecology, tribal sociopolitical organization and nativistic reactions to Europeans.
3 hours lecture
Prerequisites: Anthropology 102 or permission of the instructor

236J* Social and Cultural Change in South East Asia
This course analyzes the traditional social structure as well as changes in social, economic and cultural spheres in selected Asian countries. Historical perspective will be emphasized. Current topics such as land reform, the consequent changes, or changing values in the traditional societies will also be discussed.
3 hours lecture
Prerequisite: Sociology 101* or Anthropology 101*, 102*
238* Caribbean Society
A survey of Caribbean society in which particular attention will be devoted to an analysis of the historical, cultural and socioeconomic background of selected representative Caribbean societies, within the general framework of the continuing process of acculturation in this area.
3 hours lecture
Prerequisites: Anthropology 102* or permission of the instructor

240* Canadian Indian-White Relations 1830-1950
A survey of the adaptation of the Canadian Indian to Euro-Canadian society. The development of the Indian Act and Indian administration and policy will be explored and compared with parallel developments in the United States.
3 hours lecture, Fall term
Prerequisites: Anthropology 102* or permission of the instructor

241* 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 governments policy of withdrawing and decentralizing administrative services for native people.
3 hours lecture, Winter term
Prerequisites: Anthropology 240* or permission of the instructor

247* 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.
3 hours lecture
Prerequisites: 102* or permission of the instructor

248* Peasant Society
A survey course with data taken from Latin America, Europe, India, Southeast Asia. Included will be a consideration of different types of peasant societies, the relationship of peasants to urban areas, and the effects of modernization on peasant society.
3 hours lecture

260* Human Evolution
Data, methods and theory in the study of the origin and evolution of man. Emphasis will be on the fossil evidence.
3 hours lecture plus lab
Prerequisites: 101 or permission of the instructor

261* Primate Behaviour
An introduction to the behaviour of non-human primates with emphasis on the relevance to the origin of man.
3 hours lecture

262 Introduction to Primatology
An introduction to the study of the non-human primates. Topics discussed will include comparative anatomy, genetics and physiology of the living primates as well as the fossil evidence for primate evolution.

283* 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.
3 hours lecture

285* Introduction to Structural Linguistics 1
A general introduction to structural linguistics. A survey of linguistic approaches to the analysis and description of language.
3 hours lecture

286* Introduction to Structural Linguistics 2
A continuation of Anthropology 285*.
3 hours lecture
Prerequisite: Anthropology 285*

310* Ethnology of North American Sub-Arctic
An analysis of Northern Athabaskan and Algonkian social organization and culture from earliest European contact, the fur trade periods to the period of modern, concentrated village life. Emphasis will be upon culture change and adaptation in a theoretical framework of cultural ecology and historical development.
3 hours lecture
Prerequisite: 102*, 234 or permission of the instructor

318* North-American Archaeology - Paleo-Indian and Archaic
This course deals with the earliest known cultures in North America (mostly prior to 1000 B.C.).
3 hours lecture and tutorial
Permission of Instructor
Primarily for Honours Anthropology students
320* 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.
3 hours lecture and tutorial
Primarily for Honours Anthropology students
Offered 1975-76 and alternate years
Prerequisite: Anthropology 201* or permission of instructor

321* Recent Prehistory in the Old World
Cultural development from the agricultural revolution to the rise of literacy. Special attention to the development of agriculture as a means of subsistence and to the rise of early civilization in the Near East.
3 hours lecture and tutorial
Primarily for Honours Anthropology students
Offered every other year
Prerequisite: Anthropology 201* or permission of instructor

324* Southwestern Archaeology
The origins and development of food-producing cultures in the American Southwest.
3 hours lecture and tutorial
Permission of instructor
Primarily for Honours Anthropology students

326* Great Lakes Archaeology
A survey of the cultures in the Great Lakes area, with emphasis on the period from ca. 1000 B.C. to 1500 A.D.
3 hours lecture and tutorial
Permission of instructor
Primarily for Honours Anthropology students

330* Cultural Ecology
This course will study the inter-relations between societies and their environments. It will cover both the cultural relations to the natural surroundings and community organization.
3 hours lecture
Prerequisite: 101* and 102* or permission of instructor

333 Community Studies and Planned Change
The nature of planned programs and their implications for the communities involved are examined through ethnological studies of small communities in Canada and abroad. Reasons for the success or failure of programs of change are sought in relation to community structure.

342J* Introduction to the Study of Acculturation
A study of culture contact and the cultural changes that result, pursued through a study of representative non-European peoples in different parts of the world including their indigenous cultures and the problems of adapting themselves to the modern world.
3 hours lecture
Prerequisite: Anthropology 101*, 102* or permission of the instructor

345, 346, 347; 348, 349 Special problems in Anthropology
Lecture or seminar in special problems in anthropology. Topics may include problems in archaeology, physical anthropology, linguistics, social/cultural anthropology and will vary by term and instructor.

350* Sex Roles in Anthropology
A comparison of the roles of men and women as they are treated in the literature of anthropology. In addition, differences between male and female anthropologists in their functions as field workers, and their status in the discipline are considered.
Offered 1974-75 and alternate years
Prerequisite: consent of the instructor

355J Ethnic and Cultural Pluralism in World Perspective
A survey of representative plural societies of the world, including an analysis of the historical background and genesis of ethnic and cultural pluralism in these societies. An attempt will be made to establish the relevance of the concept of plural society for some national societies not usually recognized as such on the basis of the nature of some of their major continuing international social problems. Considerable attention will also be given to race and ethnicity and the major role these two factors play in plural societies.
3 hours lecture
Prerequisites: Anthropology 101*, 102* or permission of the instructor

356* Comparative Economic Organization
A discussion of the alternative means of organizing economic activity, focused primarily on non-market societies.
3 hours lecture
Prerequisites: 102 or permission of the instructor

359* Political Anthropology
The study of political behaviour in both state and non-state society. A comparative approach will be used with a thorough examination of the political systems of selected societies.
3 hours lecture
Prerequisites: 102 or permission of instructor
360* Genetics and Variability in Human Populations
Study of variation and its causes in contemporary human populations.
3 hours lecture
Prerequisites: 260* or permission of instructor

361* Behaviour and Evolution
Analysis of the relationship between behaviour and natural selection in human evolution. Attention will be paid to theory as well as data from fossil evidence and other sources.
3 hours lecture
Prerequisites: 260* or permission of instructor

362* New World Civilization
Problems in cultural dynamics will be considered as exemplified in the rise and effects of the civilizations of Meso and South America. Data is provided primarily by the archaeological record.
3 hours lecture
Prerequisites: 101* or permission of the instructor

370* Ethnographic Field Methods
Traditional and recently developed approaches to ethnographic field work are explored. The problems the worker faces in the field, and possible solutions to them, are discussed. Some effort will be made to develop field technique in simulated and/or real field situations.
3 hours lecture
Prerequisites: 102* or permission of the instructor

371 Archaeological Field Methods
Data gathering techniques will be studied and applied in field work on both constructed and natural archaeological sites.
3 hours lecture
Offered occasional summer sessions only
Prerequisites: 101* or permission of the instructor

372* Archaeological Techniques
Methods of gathering, processing and interpreting archaeological data will be studied. Limited excavations will be followed by laboratory analysis of collected materials.
4 hours lecture, plus lab
Prerequisite: 101* or permission of instructor. This course will ordinarily be offered in Fall terms. Students cannot receive credit for both 371 and 372*

380* Language and Culture
The importance of language in culture. Language is examined as a vehicle of culture (a linguistic code as a device for communication), as a mirror for culture (lexical and semantic aspects), and as a tool of society (uses and functions of language). Illustration will be from a variety of languages.
3 hours lecture
Prerequisite: At least one previous half-course in linguistics and one in cultural/social anthropology

381* Semology
A linguistic approach to the study of meanings expressed in the grammatical systems and lexical sets of particular languages.
3 hours lecture
Prerequisites: Anthropology 283* or 285*

388* Applied Anthropology
The technical and ethical aspects of directed culture change will be examined.
3 hours lecture
Prerequisites: 370* or permission of the instructor

390, 391*, 392, 393*, 395* 397* Reading in Anthropology
Guided reading in a selected portion of the anthropological literature.
Prerequisites: Anthropology major and permission of the instructor

401 Seminar in the Literature of Social and Cultural Anthropology
Seminar in the literature of Social and Cultural Anthropology. Intensive reading and discussion of classic studies in ethnography.
Prerequisites: 102* or permission of the instructor

420* 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, general and specific evolution.
Seminar
Prerequisites: Anthropology 102* or permission of the instructor

449*/450* Honours Seminar
Seminar on selected contemporary issues in anthropology. Open only to Honours Anthropology students.

451* The Formative Years of Cultural Theory
A survey of the history of cultural theory from 1850 to 1940.
3 hours lecture
Prerequisites: Anthropology 101*, 102*.
452* Contemporary Cultural Theory
A survey of cultural theory from post World War II to the present.
3 hours lecture
Prerequisites: Anthropology 101*, 102*

458* Archaeological Theory
A seminar on selected topics in archaeological theory.
Prerequisite: Anthropology 102* and an additional half course in archaeology or permission of the instructor

460* Advanced Physical Anthropology
An examination of selected topics of current research interest in physical anthropology. Students will be encouraged to undertake guided research projects.
Seminar
Prerequisites: Anthropology 260*, 360* and permission of the instructor

480* Theoretical Approaches to Linguistic Description
Different theoretical approaches – stratificational, transformational and signals grammar, one approach to be emphasized during each offering.
Seminar
Prerequisites: Anthropology 285 or English 375

499 Honours Essay
Directed reading and research in a selected area of anthropological inquiry.
Open only to Honours Anthropology students
Undergraduate Course Descriptions

101 Tutorial 102 Tutorial
Systems Design first year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, inter-relation of coursework, later work and engineering practice will be discussed.
Non-credit courses

111 Calculus 1

112 Calculus 2
Techniques of systematic integration, applications of integration. Sequences, series, infinite series, power series, with applications.

113 Linear Algebra (formerly SD 115)

114 Theory and Applications of Probability

121 Digital Computation
Introduction to electronic digital computers; hardware and software organization, basic features of Fortran, examples of efficient algorithms for engineering computations.

131 Engineering Economics (formerly SD 132)
Cost-benefit analysis, critical path methods, interest, project economics, decision making, utility theory, project organizational theory.
142 Introduction to Ergonomics
The man-machine environment complex; the nature of the operational environment; human sensory processes, perception, human information processing; motor function; human work, skill, fatigue; problems of acoustic noise, vibration, heat, cold; needs of ventilation, lighting.

161 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 from various areas such as container handling, air traffic control, telephone systems, work group systems, local government, respiratory systems, economics of ship building, etc.

162 Engineering Design Methodology
An introductory course on the principles of engineering design culminating in a project involving the solution of a relevant need. Specific topics introduced are: The systems approach, principles of planning, the statement of a design problem and the flow of information. Innovation and the creation of design solutions, physical, economic and financial feasibility, solution evaluation and selection. Value and utility, simulation, modelling and optimization.

181 Statics (formerly SD 151)
Statics of particles, vectors, equilibrium of rigid bodies, centroids, the analysis of structures, forces in beams and cables, friction and moments of inertia.

182 Dynamics (formerly SD 152)
Rectilinear motion, plane motion, dynamics of particles, work and energy, linear momentum, rotational motion, angular momentum, harmonic motion, gravitational, wave motion.

183 Graphics and Design (formerly SD 181)
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.

184 Electricity and Magnetism (formerly SD 281)
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, transformers, motors, generators, introduction to basic electronic devices.

192 Systems Design Laboratory, I (formerly SD 291)
An integrated laboratory sequence stressing human sensing and an introduction to electronic measurement techniques. Part of the material will be chosen to accompany SD 184 Electricity and Magnetism.

201 Tutorial 202 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

211 Applicable Mathematics for Systems Design 1
(Also listed as Mathematics 61)
First order differential equations, integrating factor, higher order differential equations, complex variables, forced and free solutions to differential equations, transient and steady state solutions, applications. Fourier series, Fourier transforms and applications.

212 Applicable Mathematics for Systems Design 2
(Also listed as Mathematics 62)

213 Theory and Applications of Statistics
(formerly SD 211)

221 Numerical Analysis and Computation
(formerly SD 222)
Application of digital computers to the solution of equations; determinants and matrices; eigenvalue problems, numerical solution of ordinary differential equations; difference equations, numerical integration methods; error analysis.

252 Physical Systems 1
Component models, interconnection models, system equations and their rank properties and solutions. These concepts are developed with respect to electrical systems.
261 Systems Design Workshop 1

262 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 to which the student becomes exposed each year. Both the problems and the student's work are expected to increase in sophistication and complexity in accordance with the student's progress through the course.

264 Form and Function in Design
The manipulation and arrangement of defined spaces with emphasis on the interrelation between spatial geometry and spatial perception; the creation of the perceived spatial patterns or designs by the use of module, proportion, rhythm, and symmetry in spatial arrangement; theories of spatial perception, spatial packing and their contribution to the problem of creating spatial arrangements.

281 Mechanics of Deformable Solids
(formerly SD 282)
Statics and resistance of materials, Equilibrium of particles, rigid bodies and deformable bodies. Vector fields, Bay systems. Stress-strain relationships. Elastic and inelastic behaviour of prismatic members subjected to axial, shearing, torsional and flexural deformations.

282 Thermodynamics
(formerly SD384)
An introductory course in engineering Thermodynamics structured for students in Systems Design. Classical thermodynamics is presented as the systematic study of energy: its use, degradation, and waste. Applications focus on problems of energy and environment. The concepts of statistical thermodynamics are introduced briefly and their connection with information theory are described.

284 Fluid Mechanics

286 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.

291 Systems Design Laboratory 2 (formerly SD 292)
A continuation of SD192 for second year students. The emphasis will be on electronic measurement techniques and associated transducers. Some of the material will be chosen to accompany transducers.

301 Tutorial 302 Tutorial
Systems Design third year students will meet with a faculty member designated as their class professor. Performance in assignments, conceptual difficulties with courses, inter-relation of coursework, later work and engineering practice will be discussed.

Non-credit courses

311 Systems Operations 1
Introduction and background to the application of scientific models to the study of operational problems. This course is intended to present an integrated view of the "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.

322 Computer Simulation of Systems
System modelling, discrete and continuous system models; system simulation techniques, digital computer methods, fundamentals of analog computation, time and magnitude scaling; analog computer simulation methods; digital simulation of analog computers; block-oriented languages; advantages and disadvantages of digital and analog simulation techniques, introduction to system simulation using hybrid computers.

324 Principles of Digital Computers
Boolean algebra, number systems and data representation; flip flops and registers; computer operation, control unit, instruction sequencing, arithmetic unit; storage organization; operating systems, compilers, assemblers, multiprogramming, multiprocessing and time-sharing.

332 Mathematical Programming
(formerly SD 513)
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.
333 Experimental Design
Optimum seeking methods: 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 with a systematic treatment of the analysis of multiple classifications involving fixed and random effects and crossed and nested variables of classification. Applications of statistical methods to the efficient design of industrial experiments with considerations to suitability.

341 Ergonomics of Special Environments (formerly SD 541)
Neuroendocrine system and the human response to stress (Adaptation); sustained acceleration, weightlessness and restrictive confinement; hypobarism, hypoxia, and high altitude; hyperbarism and underwater environments; impact acceleration and automotive safety; toxic atmospheric contamination.

351 Physical Systems 2
The subject matter is similar to SD252 except that the development is based on other physical systems such as structural and hydraulic systems.

352 Algorithms for Computer-Aided System Analysis
(formerly SD 354)
Techniques for tree selection, manipulation of topological information, evaluation of the exponential function of a matrix, etc. The emphasis is on the algorithms but students will be expected to implement them on the computer. The course includes a survey of the capabilities of existing programmes for system analysis.

353 Time Domain Models for Physical Systems
State equations for two-terminal component systems; time varying and non-linear components; analytical solutions for state models, numerical and analogue methods for solution.

361 Systems Design Workshop 3
A continuation of the Systems Design Workshop for third year students.

362 Systems Design Workshop 4

364 Manufacturing Science

366 Aesthetic and Perceptual Aspects of Design
(formerly SD 563)
Presentation and discussion of appropriate and possible methods for the design of systems or artifacts in which aesthetic characteristics and visual form are primary requirements of the design.

381 Material Engineering
A general introduction to the science of materials; so providing a basic understanding of the scientific principles involved and an introduction to the wide variety of materials available to the designer today. 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 our everyday use.

382 Applied Electronics
Component models of various electronic devices: oscillation, amplification, modulation, detection, application to instrumentation.

401 Tutorial 402 Tutorial
Systems Design fourth year students will meet with a faculty member designated as their class professor. Conceptual difficulties, the inter-relation of course work and engineering practice will be discussed. Non-credit courses

411 Systems Operations 2 (formerly SD 312)
A continuation of SD311, with emphasis on Stochastic Operations Research Models. Topics will include: Decision making under uncertainty, queueing models and related probabilistic techniques, feedback control, probabilistic inventory, competitive strategies and related topics.
412 Topics in Operations Research (formerly SD 411)
Readings suited to individual interests of the students, and aimed at solving special project problems students may select.

421 Computer Aided Design I
The design process; computer-oriented system models; simulation languages for continuous and discrete systems; man-machine interaction; design of problem-oriented computer language.

431 Economics of Engineering Design
The course deals with economics in the engineering design environment. The economics of resource assignment to research and development, applications of such techniques as benefit/cost and cost/effectiveness analysis to engineering design projects; economic problems with product life, obsolescence, design cycles, etc.

432 Analysis of Large Systems
The course encompasses techniques for the analysis of systems for which physical laws do not provide a simple guideline, viz., systems in which there is human intervention and decision making. Topics include macroscopic modelling of large scale resource and societal systems, decomposition techniques, graph-theoretic and computer based methods of analysis, decision and control problems, other problems concerned with complexity, largeness and aggregation.

433 Conflict Analysis (formerly SD 331)
The application of non-quantitative game theory to the analysis of conflict, particularly conflicts arising in the implementation of design projects, the general characteristics, (through Metagame theory) and specific applied techniques for analyzing conflicts between parties each with separate objectives.

441 Human Function (formerly SD 242)
The structure and function of man in relation to systems design; the relationship of biology and human physiology to engineering; biological concepts, biological variation. Introductory concepts in molecular biology and genetics; the cell as a micro-system; the role of water transport; man as a complex of systems and subsystems; the nature of selected subsystems (including introduction to electrophysiology).

443 Human Engineering and Rational Design
(formerly SD 342)
The Man-machine interface; communication and the design of displays (visual, auditory, kinesthetic, tactile, etc.); human motor activities, speed, accuracy, strength and force; functional operation and the design of controls; illumination, colour, and design of workplaces.

451 Multi-Terminal Representations and Piecewise Analysis of Physical Systems
Multi-terminal representations, coupled 2-terminal components, tree transformations, solution of large systems through subsystems, two-ports and their interconnection, equivalent 2-terminal component systems.

452 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.

454 Hydraulic Systems
Applications of systems theory to the analysis of hydraulic systems; particular emphasis is given to the analysis and design of fluid distribution systems.

456 Power Systems (formerly SD 453)
Application of systems theory to large power distribution networks and electromechanical energy conversion systems.

461 Systems Design Workshop 5
462 Systems Design Workshop 6
A continuation of the Systems Design Workshop for fourth year students. The emphasis will be on an individual problem chosen from the student's technical option area.

463 Structure and Design
Introduction to problems of definition and enclosure of space with structure and materials; occupancy problems; functional criteria. Problems associated with the effect on the user's perception of spatial arrangements associated with the manipulation of materials and structural design will be discussed.

464 Theory and Application of Photographic Methods to Measurement and Design
The basic theory of photographic measurement techniques; photo-instrumentation; high and low speed data recording techniques and theory; sub-microsecond shadow-graphs; photomicrography and photomacrography; theory and visual techniques of photographing physical models; visual perception in engineering design; pulsed visual teaching and learning methods; photographic methods for design and industry; specialized applications and data analyzing tools.
472 Man-Machine Communications (formerly SD475) The nature and design of machine-mediated human communication systems. Consideration will be given to displays, computer graphics, computer-aided instruction and mass communication media (Film, T.V., radio, print). The design of new media, innovation. A system approach will be adopted with special attention to the socio-economic effects of such systems.


512 Application of Linear Graph Theory Topological formulas for general linear systems, synthesis of communication nets, system diagnosis. Applications to switching theory, sociology, economics, etc.

521 Analog and Hybrid Computing Systems Theory and operation of analog computers, parallel logic; digitally simulated analog computers; introduction to hybrid computing.

522 Computer-Aided Design 2 A detailed study of two major simulation languages, one continuous (CSMP or equivalent) and one discrete-event (GPSS or equivalent). Simulation projects.

534 Planning of Facilities Industrial and Non-Industrial facilities. Networks, locational analysis, physical layout and spatial analysis, allocation of facilities, criteria for optimality, utilization and occupation, various operations research techniques for the analysis and synthesis of networks of facilities, n-job, m-machine problem.

542 Human Engineering and Systems Development Human function in systems; man's capacities and limitations as a component of a complex system; assignment of operations to man and machine, equipment design in relation to human capacity; training programmes, procedures, and devices; task description and analysis; analytic methods for test and evaluation in human engineering.

543 Human Engineering Man-machine systems; man-machine interface; presentation of information; design of displays and controls; workplace layout, human factors in design.

544 Ergonomics Significance of ergonomics; man-machine-environment complex; physiology of work, fatigue, and boredom; environmental factors in industry (noise, vibration, vision, illumination, heat, cold, toxic chemicals, radiation); industrial, and automotive safety.

564 Methodological Processes in Design 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.
School of Urban and Regional Planning

Professor, Director
H.S. Coblenz, B.A.(Durham), M.R.P.(North Carolina)

Associate Professor, Associate Director

Associate Professor, Graduate Officer
G.G. Mulamootil, B.Sc.(Mysore), M.Sc.(Bombay), Ph.D.(Delhi) (on Sabbatical Leave 1975-76)

Associate Professor, Undergraduate Officer

Professors
R.S. Dorney, B.Sc., M.Sc., Ph.D.(Wisconsin)
L.O. Gertler, B.A.(Queen's), M.A.(Toronto), M.C.I.P.
K. Izumi, B.Arch.(Manitoba), M.C.P.(M.I.T.), M.C.I.P., A.I.P.
R.R. Krueger, B.A., M.A.(Western), Ph.D.(Indiana)

Associate Professors
L.R.G. Martin, B.A.(Queen's), M.A., M.R.P., Ph.D. (Syracuse), M.C.I.P.
G.B. Priddle, B.A.(Western), M.A., Ph.D.(Clark)
K.S. Sayegh, B.Sc.(Cairo), M.C.P., Ph.D.(Harvard), M.C.I.P.
S.M. Weaver, B.A., M.A., Ph.D.(Toronto)

Assistant Professors
J.K. Gerecke, B.A.(Saskatchewan), M.A., Ph.D. (U.B.C.)
S. Herzog, B.Arch.(Toronto)
M. Lazarowich, B.A.(Saskatchewan), M.A., M.C.P. (Cincinnati)
N.E.P. Pressman, B.Arch.(McGill), M.Arch.(Cornell), Cert. Urban and Social Planning(Manchester), M.C.I.P.
J.B. Theberge, B.Sc.(Guelph), M.Sc.(Toronto), Ph.D.(U.B.C.)

Adjunct Professor
D.S. Barrows, B.Sc., M.A.(Northwestern)
D.M. Connor, B.Sc.(Toronto), M.Sc., Ph.D.(Cornell)
A. deVos, M.Sc., Ph.D.(Wisconsin)
J.A. Kennedy, B.A.(Loyola), LL.B.(Osgoode), Q.C.

Professional Liaison Officer
H.T. Lemon, M.C.I.P.

Planning Graphics Technician
C. Kibbe, B.E.S.(Waterloo)

Faculty members holding joint and/or cross appointments as shown
1 Planning, Geography and Biology
2 Geography and Planning
3 Architecture, Geography, Man-Environment Studies and Planning
4 Planning and Man-Environment Studies
5 Anthropology and Planning
6 Planning, Man-Environment Studies and Biology

Undergraduate Course Descriptions

100 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. Prerequisite: Planning students only 3 hours lectures, 1 hour discussion, Year

156* 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. Prerequisite: None (Not available for credit to Planning students) 2 hours lectures and 1 hour discussion, Fall and Winter terms
159* 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.  
Prerequisite: Planning students only  
2 hours studio, Fall and Winter terms  
Estimated cost to student: $20

ES 195* Introduction to Environmental Problems  
See Environmental Studies course descriptions, page 299

ES 200* Field Ecology  
See Environmental Studies course descriptions, page 299

222* Canadian Regional Issues  
Selective study of Canadian development issues pertaining to the use of land, urbanization, regional and resource development; issues will be related to the structural and functional forces that are characteristics of the major regions of Canada, e.g., Atlantic Provinces, British Columbia.  
Prerequisites: none  
2 hours lectures, 1 hour discussion, Winter term

Note  
Students may not take both Planning 222* and Geography 322*

230* 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 relations will be examined and related to planning.  
Prerequisite: Sociology 101, or consent of instructor  
3 hours lectures, Winter term

ES 252* Media Tools for Environmental Studies  
See Environmental Studies course descriptions, page 299

ES 253* Media Tools for Environmental Studies - Advanced Level  
See Environmental Studies course descriptions, page 299

255* Planning Surveys and Analysis  
Sources of data for planning and their analysis. The course will emphasize the sources, methods of collection and analysis of urban and regional land-use data. Particular attention is paid to the types of land-use information essential to transportation, housing, public facilities and recreation planning. Both lecture and workshop are related to a significant problem of land-use planning in Ontario.  
Prerequisite: Planning 100* or consent of instructor  
2 hours lectures, 2 hours workshop, Winter term

256 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.  
Prerequisite: 2nd year Planning, or Environmental Studies students with consent of instructor  
2 hours lectures, 2 hours studio, Year

258* 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.  
Prerequisite: Planning 100*, or consent of instructor  
Prior to registering for this course students must arrange with a faculty member to serve as advisor  
3 hours seminar and/or tutorial  
Fall or Winter terms

271* 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. This course is the same as Geog. 271* and M.Env. 271*. The School of Planning strongly recommends that students, who have not had Year 5 Maths, take Math 85.  
Prerequisite: only for students in General or Honours Geography, Planning, Man Environment Studies or Architecture  
2 hours lectures, 1 hour lab, Fall and Winter terms

272* Computer Programming in Environmental Studies  
This course emphasizes computer programming skills and applications in the context of environmental problems.  
Cross listed as Geog. 272* and M.Env. 272*  
Prerequisite: 271, or consent of instructor  
3 hours, Winter term
300 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.

Prerequisite: 3rd Year Planning students only
3 hour workshop, Year

301 Planning Design

A study of a particular design aspect of planning through a series of individual and group projects. The topic varies each term.

Prerequisite: consent of instructor
3 hours, studio/workshop, Fall and Winter terms

307 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 Geography 307*.

Prerequisite: may be taken in 2nd or 3rd year
2 hours lectures, 1 hour practical or discussion, Fall and Winter terms

316 Multivariate Statistics

The theory and application of multivariate statistics, with particular emphasis upon the use of the computer. Cross-listed as Geography 316*.

Prerequisite: Planning 271*, or consent of instructor
3 hours seminar and/or tutorial, Fall term

317 Nonparametric Statistics

The theory and application of non-parametric statistics with emphasis upon social science problems. Cross-listed as Geography 317*.

Prerequisite: Planning 271*, or consent of instructor
2 hours lectures, 1 hour practical, Winter term

318 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 Geography 318*.

Prerequisite: Planning 271*, or consent of instructor
3 hours lectures, Winter term

319 Regional Planning Techniques

Application of economic and social measurement techniques in regional planning. Discussion of input-output analysis; cost-benefit analysis, planning, programming and budgeting systems; and social area analysis. Cross-listed as Geography 319*.

Prerequisite: Econ. 101*, 102*, or consent of instructor
3 hours seminar and/or tutorial, Fall term

330 Urban Social Planning

This course examines a variety of urban social concerns and possible solutions to them. The solutions will focus on social planning, community development and social action. As well, the relationship between physical and social planning will be considered.

Prerequisite: Sociology 101*, or consent of instructor
3 hours lectures, Winter term

332 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.

Prerequisite: Sociology 101*, or consent of instructor
3 hours lectures, Fall term

333 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.

Prerequisite: Sociology 101*, or consent of instructor
3 hours lectures, Winter term

342 Urban and Regional Planning: (Part 1)

The physical structure of the city and its cultural, social, economic and behavioural bases; supporting systems and environmental relationships.

Prerequisite: None (Not available for credit to Planning students)
3 hours lectures, Fall term

343 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.

Prerequisite: Planning 342 or consent of instructor (Not available for credit to Planning students)
3 hours lectures, Winter term
**344* Principles of Recreation Planning**
An exploration of the nature and functions of recreation in modern urban-industrial societies and an analysis of alternative approaches to the planning of recreation opportunities in urban-centred regions. The demand for and supply of recreation opportunities; standards, models and systems; recreation planning policies and agencies; and selected recreation planning issues.
Prerequisite: This course is open only to students in 3rd and 4th years
3 hours lectures, Fall and Winter terms, (Winter-term – Planning students only)

**357* Conservation and Resource Management**
History of the conservation movement; ecological principles of conservation and resource management. Analysis, use and planning of recreational resources. This course is the same as Geography 357* and Man-Environment 357*.
Prerequisite: Environmental Studies 200*. This course is open only to students in 3rd and 4th years
3 hours lectures, Winter term

**ES 358* Environmental Pollution and its Control**
See Environmental Studies course descriptions, page 299

**358* Regional Planning and Development**
The relationship of economic planning to regional planning. Theory and practice of regional planning and development to urban-centred, broad socio-economic, and frontier regions. A series of workshops focus upon the social and economic problems of a particular Canadian region and the role of federal, provincial and local governments in formulating and applying remedial policy. Reference is made to comparative planning strategies and policies in other nations.
Prerequisite: one of Planning 100, 156*, 342*, or consent of instructor
2 hours lectures, 2 hours workshop, Winter term

**360* Technology in Urban and Regional Planning**
The influence of transportation, communications, and water and sewage systems on the form, function and development of cities and regions; the application of this knowledge in urban and regional planning.
Prerequisites: Planning 256* or consent of instructor
3 hours lectures, term to be arranged

**370* 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.
Prerequisites: Planning 255*, or consent of instructor
3 hours lectures, term to be arranged

**ES 380*/381* Environmental Studies Workshop**
See Environmental Studies course descriptions, page 300

**391* Field Research Methods and Projects**
Selected field trip experiences directly related to the theme content of Planning 300, including assignments, follow-up discussion, and presentation of research papers. The School covers the cost of travel and accommodations for field trips. Students are responsible for the cost of their meals. Approximately $45.00 will cover the cost of meals on a one week field trip.
Prerequisite: enrolment in Plan 300

**ES 400 Environmental Law**
See Environmental Studies course descriptions, page 300

**414* Housing Policies**
Focus on Canadian housing policies and programs, particularly with regard to the housing of low and moderate income families. Economic, political, physical and social considerations underlying these policies will be examined in detail. Some consideration is given to housing problems and programs in the United States and developing countries.
Prerequisite: Planning 256, or consent of instructor
3 hours lecture, Fall term

**430* Social Policy Planning**
This course will examine and evaluate a number of social policy issues (poverty, health, education and public safety) in relation to social goals, social indicators, and program planning and development. The role of planners in social policy formulation and implementation will be stressed.
Prerequisite: Planning 330* or consent of instructor
3 hours lectures, term to be arranged
449 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 in-depth examination of comprehensive planning and zoning, and the scope of planning education especially in our School.
Prerequisite: Consent of School
Summer session (July-August, 1975)

450 Canadian Urban and Regional Planning: (Part 2)
A review of Canadian urban literature focusing on major themes. The literature will be examined through subject areas such as housing, land policy, redevelopment and urban politics.
Prerequisite: Consent of School
Summer session (July-August, 1975)

456 Political and Administrative processes in Urban and Regional Planning
The formulation of urban/regional policy, including planning legislation, in an inter-governmental setting: federal, provincial and municipal; the study of both the process and substance of urban policy-making, planning and implementation in Canada.
Prerequisite: 4th year Planning students, or 4th year Environmental Studies students with consent of instructor
2 hour lecture/seminar, Year

470* Concepts and Ideas in Contemporary Urban Planning
An overview of the modern movements and philosophical roots underlying urban planning and civic design. Philosophies and contributions of those who have significantly influenced modern historical thought. Development of planning trends and ideas in North America and abroad emphasizing relevance to contemporary concerns.
Prerequisite: 3rd or 4th year Planning students, or consent of instructor
2 one hour lectures/seminars, Winter term

475* Projects, Problems and Readings in Planning
Special planning projects and problems chosen in consultation with instructor.
Prerequisite: Consent of instructor
A student must arrange with a faculty member to serve as advisor prior to registering for this course
3 hour seminar and/or tutorial, Fall and Winter term

476 Projects, Problems and Readings in Planning
Special planning projects and problems, chosen in consultation with instructor.
Prerequisite: consent of instructor
A student must arrange with a faculty member to serve as advisor prior to registering for this course
3 hours seminar and/or tutorial, Year

480 The Philosophy and Methodology of Urban and Regional Planning
A seminar course on some current and changing social philosophies, the image of man, the notions of ethics, morality, authority, equity, etc., and the related perceptions and perspectives and conceptions of social and environmental realities and their relevance to planning, its human information base, processes and procedures.
Prerequisite: 4th year Planning students only
3 hours seminar/workshop, Year

490 Senior Honours Essay
Practical experience in the identification of a problem in the planning field. Conduction of individual research into this problem and presentation of the results of this research in a form that meets both professional and academic standards.
(2 course credits)
Prerequisite: 4th year Planning students only
Women's Studies

A selection of courses concerning women will be offered through the departments of English, History, Political Science, Psychological and Sociology and Anthropology. These courses in Women's Studies are designed to approach the study of women from various perspectives and will explore such areas of interest as the past and present roles of women, the treatment of women in contemporary sociological theory, women anthropologists, the nature and role of women in literature, the behavioural development of women and of sex differences, sexual relations and the family in European culture, the role of sex-related ideologies to larger processes of economic and political change, and political participation of women. Students who are interested in the Women's Studies courses listed below will find complete course descriptions in the appropriate departmental sections of this Calendar.

Anthropology 350*
Sex roles in Anthropology

English 108E*
Women in Literature

English 208E*
Women Writers of the Twentieth Century

History 203H*
The individual and the Family in History

Political Science 116*
Political Participation: The Case of Canadian Women

Psychology 102*
Psychology of Women Today
May be offered 1975-76

Psychology 365*
The Behavioural Development of Women

Sociology 215*
Sociology of Sex Roles

Sociology 415*
Seminar on the Impact of Sex Factors on Sociological Theory and Research

Social Work 369R*
Women and Social Work
Governing Bodies and Staff
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The Mayor of the City of Waterloo
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Principal, St. Paul's College
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Principal, Renison College
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To 1977
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Associate Dean (Graduate Studies)
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Assistant Director, Women's Athletics
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Ancillary Enterprises

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Director, Housing and Residence Operations
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Security

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