Inquiries and formal applications for admission should be directed to the Registrar, University of Waterloo, Waterloo, Ontario. Telephone 743-2681. (Area code 519).

The Registrar's Office is located in Room 232 of the Physics and Mathematics Building. Office hours are from 9 a.m. to 12 noon, 1 p.m. to 5 p.m., Monday through Friday. The office is not open on Saturdays.

The Senate and the Board of Governors of the University of Waterloo reserve the right to make changes in this calendar without prior notice.
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THE UNIVERSITY OF WATERLOO

The University of Waterloo is incorporated as a non-denominational institution of higher learning offering courses, both at the undergraduate and graduate level, in Arts, Engineering, and Science. Classes 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. The University became a member of the National Conference of Canadian Universities and Colleges in June 1961, and of The Association of Universities of the British Commonwealth in November 1961.

St. Jerome's College, a Roman Catholic church-related liberal arts college, which had been affiliated with the University of Ottawa since 1947, entered into federation with the University of Waterloo in July, 1960. It offers a basic undergraduate programme of Arts courses which can be supplemented by courses offered by the University. In September of 1962, St. Jerome's College opened three new buildings on the University Campus: a teaching and administration building; a men's residence with accommodation for one hundred students; and a women's residence with accommodation for fifty-five students under the supervision of the School Sisters of Notre Dame.

Renison College, an Anglican church-related liberal arts college incorporated in 1959, became affiliated with the University in July, 1960. The college, which is co-educational and residential is located in new buildings on the University Campus. Renison College provides accommodation for 40 men and 40 women.

St. Paul's College, a United Church residential college and student centre, became affiliated with the University in 1961. St. Paul's College provides accommodation for 100 men and 50 women.

Conrad Grebel College, a Mennonite residential college and student centre, became affiliated with the University in 1961. This college expects to be established in its own buildings on the University Campus in 1964.

The buildings of the University of Waterloo are situated on an attractive site of over 200 acres in the northwest section of Waterloo. The first building on the campus, the Chemistry-Chemical Engineering Building, was occupied in September, 1958. The second building, the Physics and Mathematics Building, was occupied in September, 1959. The Engineering Building was occupied in December, 1961. Construction of the Arts Building commenced during the Autumn of 1961 and was completed in August, 1962. All the University buildings are completely air-conditioned. The general administrative offices of the University are temporarily located in the Physics and Mathematics Building. The athletic facilities of the University are located at Seagram Stadium, and include a fully-equipped gymnasium, a quarter-mile track, and a football field. The University Cafeteria and the student offices are situated in Annex 2, a temporary building east of the Engineering Building. The University greenhouse is situated to the south of the Chemistry-Chemical Engineering Building.

Additional teaching buildings, as well as a main library, residences, an auditorium, and a student union building are to be completed within the next few years. Students in all faculties are eligible to apply for residence in either St. Jerome's College, St. Paul's College or Renison College. In addition, until such time as the University can provide additional residence facilities, suitable accommodation may be obtained, through the University Housing Service, in private homes.
II

THE FACULTY
OF ARTS
THE FACULTY OF ARTS

The University of Waterloo offers courses of study in the liberal arts leading to the degree of Bachelor of Arts.

The curriculum is arranged to provide two paths to the B.A. degree. The paths are:
1. General Arts Course, demanding three years of study. The student selects a major area of study for greater concentration of work in his Second and Third Years.
2. Honours Arts Courses, demanding four years of study. The student selects the particular subject or group of subjects in which he wishes to do honours work and pursues studies in his specialized field at greater depth. Students interested in high school teaching qualify later for Type A certification in those subjects where regulations require an honours degree.

The arrangement of the arts curriculum attempts to satisfy the basic requirements of a liberal education. Two of these are the achievement of a liberal breadth of studies and the mastery of a particular study or group of studies. Working within the principles implied by these requirements, the curriculum must provide also opportunity for the student to satisfy his purposes in attending University. His purpose may be related to opportunity for personal, intellectual, and social growth, whereby he may come to have wider appreciation of and greater satisfaction from life's experiences. He may view a University education as making himself a more effective citizen generally. In many, if not in a majority of cases, a university liberal arts education opens doors to the professions, either directly or by qualifying him to pursue further professional studies.

Working within the above criteria, the curriculum in liberal arts at the University of Waterloo has been arranged to permit all students to participate in a variety of studies, especially in the First year. The programme of studies does demand also a measure of concentration of study in both the General Course, and, to a much greater extent, in the Honours Courses.

A dimension of educational experience at the University of Waterloo which will diminish with the passing of time is related to the youth of the University itself. The arts programme is just entering its fourth year. Students coming to the University of Waterloo now have an opportunity, not only to share in the usual activities characterizing student and academic life of a University, but to be part of the development of those ideas and activities which will become in the years ahead the traditions of the University. This challenging aspect of life at the University of Waterloo is one which gives opportunity for creative thinking for students presently enrolled and for those who enrol in the immediate years ahead.
DEGREES

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

PASS COURSE (3 YEARS)
The General Course in Arts

HONOURS COURSES (4 YEARS)

<table>
<thead>
<tr>
<th>Economics</th>
<th>French and Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Geography</td>
</tr>
<tr>
<td>English and French</td>
<td>German and Russian</td>
</tr>
<tr>
<td>English and German</td>
<td>History</td>
</tr>
<tr>
<td>English and History</td>
<td>Mathematics</td>
</tr>
<tr>
<td>English and Latin</td>
<td>Mathematics and Philosophy</td>
</tr>
<tr>
<td>English and Spanish</td>
<td>Philosophy</td>
</tr>
<tr>
<td>French and German</td>
<td>Philosophy and Literature</td>
</tr>
<tr>
<td>French and Latin</td>
<td>Political Science</td>
</tr>
<tr>
<td>French and Russian</td>
<td>Psychology</td>
</tr>
</tbody>
</table>

Graduation from any of the following courses with at least Second Class Honours standing qualifies a student for admission to the corresponding Type A course at the Ontario College of Education:

Honours English
Honours English and French
Honours English and German
Honours English and History
Honours English and Latin
Honours English and Spanish
Honours French and German
Honours French and Latin
Honours French and Russian
Honours French and Spanish
Honours Geography
Honours History
Honours Mathematics
ADMISSION
AND REGISTRATION

General

Application for admission to the Faculty of Arts should be made as early in the year as possible on forms provided by the Office of the Registrar. Academic certificates (not diplomas) and other supporting documents should be forwarded as soon as they become available. Admission cannot be granted until all the requirements have been met and all documents submitted.

Students wishing to register in the Faculty of Arts through St. Jerome's College or through Renison College may apply directly to the Registrar of the respective Colleges. Students wishing to register in the Faculty of Arts through St. Paul's College or Conrad Grebel College apply to the Registrar, University of Waterloo.

Admission to Year I

In order to qualify for admission to the first year of the Arts programme at the University, ordinarily the applicant should have completed the requirements for the Ontario Secondary School Honour Graduation Diploma (Senior Matriculation) or its equivalent, showing an over-all average of 60% in nine Grade XIII papers, including:

English (Composition and Literature)

A foreign language (Authors and Composition)

Five additional papers chosen wherever possible in accordance with the student's proposed major field of study.

Additional papers can be selected from any of the optional subjects offered at the Grade XIII level with the qualification that no more than one of the following papers may be counted as an "additional" paper: Accountancy Practice, Secretarial Practice, Mathematics of Investment, Art, or Music (Departmental Examination). The marks received in one of these papers will be included in the computation of the applicant's average. Standing with the Royal Conservatory of Music in Grade VIII practical and Grade II theory will be considered one 'additional paper' on the same terms as these papers except the marks received will not be computed in the average.

The following certificates, recognized as being equivalent to the Ontario Grade XIII certificate, may be accepted insofar as they meet the admission requirements of the University of Waterloo in subjects and percentages:

<table>
<thead>
<tr>
<th>Province</th>
<th>Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>Senior Matriculation (Grade XII)</td>
</tr>
<tr>
<td>British Columbia</td>
<td>Senior Matriculation (Grade XIII)</td>
</tr>
<tr>
<td>Manitoba</td>
<td>Senior Matriculation (Grade XII)</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>Senior Matriculation (Grade XII)</td>
</tr>
<tr>
<td>Newfoundland</td>
<td>Year I Memorial University</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>Senior Matriculation (Grade XII)</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>Third Year Certificate from Prince of Wales College</td>
</tr>
<tr>
<td>Quebec</td>
<td>McGill Senior Matriculation or Quebec Senior High School Leaving Certificate</td>
</tr>
</tbody>
</table>
Admission to Advanced Standing

An applicant for admission to advanced standing must submit an official transcript from the University which he has attended, showing in detail the courses he has taken and his standing in each.

Admission as an Adult Student

Any student of mature age who has been away from formal education for more than two years, and who does not possess the minimum requirements for admission, may apply to enter as an adult student. Each application will be considered on its merits by the Admissions Committee. Under certain circumstances, the applicant may be required to write a qualifying examination.

Admission as a Part-time Student

Any candidate wishing to enrol as a part-time student may be allowed to take a maximum of two courses per session, provided he meets the regular admission requirements.

Admission of Students from Other Countries

Students from areas where English is not the common language must provide certified translations of academic certificates. In addition, the applicant may be required to take either "The English Proficiency Tests" prepared by the English Language Institute of the University of Michigan, or the examinations for "The Certificate of Proficiency in English" of the University of Cambridge, in order to satisfy the Admissions Committee that his knowledge of the English language is adequate to pursue his studies successfully. The expenses involved in administering the test must be borne by the applicant.

Re-Admission

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.

Registration

September 16—Monday—Year I—Arts

September 17—Tuesday—Year II—Arts

September 18—Wednesday—Years III and IV—Arts

Once the student has completed his registration, he may not change his course, add subjects, or drop subjects, without obtaining permission from the Dean, the instructor, and obtaining the necessary course card from the Office of the Registrar.
FEES

All fees for the academic session are due and payable on the day of registration. Credit for scholarships or bursaries will be given only on the authority of the Registrar after presentation of proof of the award.

If, for reasons acceptable to the Business Manager, the fees for the year cannot be paid in full on the day of registration, they may be paid in two instalments, but an extra charge of $5.00 will then be added to the total fee. The first instalment, to be paid on the day of registration, is a minimum of 60% of the tuition fees plus all incidental fees. The balance must be paid in full on the first day of the second term.

A charge of $2.00 per month will be made on overdue accounts. Failure to pay an overdue account before conclusion of lectures will bar a student from writing examinations or obtaining credit for previous work.

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, may entitle him to a refund of a portion of his fees. No fees will be refunded unless this procedure is followed.

Refunds of tuition fees are made at the discretion of the University.

Incidental fees are not refundable.
Sessional Fees

Tuition

$435.00

Includes registration and regular examination fees.

Health Insurance

6.50

This plan does not include the premiums or benefits of the Ontario Hospital Services Commission. Ontario Hospital Services coverage is the students' own responsibility. Students participating in any athletics are also responsible for their own coverage under the Ontario Hospital Services Commission.

Student Activities

Student Societies $5.00
Student publications 9.00
Athletics 14.00
Music 1.00

$29.00

Examinations

Supplemental—each paper 10.00
Special Examination—each paper 15.00
Presiding fee (at an outside centre, each half day) 5.00

Part Time Students

Fee per course (limit, 2 courses per session) 85.00

Miscellaneous Fees

Late Registration 10.00
Transcript of Record 1.00
Degree and Graduation—final year only 10.00

The Board of Governors reserves the right to make changes in its published schedule of fees without notice.
EXAMINATIONS
AND PROMOTIONS

1. Final Examinations

(a) The faculty constitutes the examining body for all examinations. Final written examinations for all years are held in April and May; oral examinations may be required at the discretion of individual departments. The normal time for written examinations is three hours.

(b) In every year 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 chairman of the department concerned, and 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) A student who defaults a final examination, except for a properly certified reason, shall have no supplemental examination privileges and must repeat the work in class. If a student fails for medical reasons to write, a Doctor's certificate, covering the precise period of absence, must be filed in the Registrar's Office before the end of the examination period.

2. Term Examinations

There will be no formal mid-year examinations in any year. Instructors will report the progress of all first year students to the Dean before the end of the first term. Students who are not progressing satisfactorily may be interviewed by the Dean of the Faculty of Arts of the University and in some cases may be required to withdraw for the remainder of the session.

3. Standing

(a) Letter grades signify the following standings in individual subjects:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>75-100%</td>
</tr>
<tr>
<td>B</td>
<td>66-74%</td>
</tr>
<tr>
<td>C</td>
<td>60-65%</td>
</tr>
<tr>
<td>D</td>
<td>50-59%</td>
</tr>
<tr>
<td>F</td>
<td>less than 50% (Failure, no supplemental allowed)</td>
</tr>
<tr>
<td>S</td>
<td>less than 50% (Supplemental allowed)</td>
</tr>
</tbody>
</table>

Standing in an individual subject is determined by combining the marks assigned for term work with those obtained in the final examination.

(b) Standing in Year I is indicated by the following terms:

<table>
<thead>
<tr>
<th>Range of average marks</th>
<th>Standing</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-100%</td>
<td>A</td>
</tr>
<tr>
<td>66-74%</td>
<td>B</td>
</tr>
<tr>
<td>60-65%</td>
<td>C</td>
</tr>
<tr>
<td>50-59%</td>
<td>D</td>
</tr>
<tr>
<td>49 or less</td>
<td>F</td>
</tr>
<tr>
<td>Supplementals allowed</td>
<td>Conditional</td>
</tr>
</tbody>
</table>

16
(c) In order to enter Second and subsequent years of the General Arts course a student must obtain a minimum over-all average of 50% and a minimum of 60% in the subjects of the field of specialization.

(d) In order to enter the second year of an Honours Arts Course, a student must obtain a minimum over-all average of 60% in his first year studies, and a minimum of 60% in the proposed field of specialization. To obtain standing in the second and subsequent years of an Honours Arts Course, a student must obtain an over-all average of at least 60% and a minimum average of at least 66% in the subjects of his field of specialization unless otherwise specified in a departmental honours programme.

(e) Standing in the second and subsequent years, is indicated by the following terms:

<table>
<thead>
<tr>
<th>Range of Average Mark</th>
<th>Honours Course*</th>
<th>General Course*</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-100</td>
<td>First Class Honours</td>
<td>A</td>
</tr>
<tr>
<td>66-74</td>
<td>Second Class Honours</td>
<td>B</td>
</tr>
<tr>
<td>60-65</td>
<td>Third Class Honours</td>
<td>C</td>
</tr>
<tr>
<td>50-59</td>
<td></td>
<td>D</td>
</tr>
</tbody>
</table>

*The marks obtained in the subjects of specialization and related subjects will also be taken into account in assigning standing.

4. Failure

(a) A student who fails more than two full courses of a regular programme at the final examination fails his year. He is not eligible for supplemental privileges.

(b) Any student granted permission to repeat his year must take a full complement of courses. The Dean may, at his discretion, grant the student credit for courses in which he has secured "A" standing.

(c) A student will ordinarily be granted the privilege of repeating one year only.

5. Supplemental Examinations

(a) To be eligible for supplemental examinations at the end of Year I, a student
   i) must have attended a reasonable number of lectures in the course in which he proposes to write, and must have satisfied all term work requirements;
   ii) must not have failed more than two full courses;
   iii) must not have defaulted the final examination except for a properly certified reason;
   iv) must have obtained a final over-all average of at least 50%.

(b) To be eligible for supplemental examinations beyond Year I, a student
   i) must have shown satisfactory term work progress to at least grade "C" in the subject in question;
   ii) must not have failed more than two full courses;
   iii) must not have defaulted the final examination except for a properly certified reason;
   iv) must have obtained a final over-all average of at least 50% in a General Course and 60% in an Honours Course with 66% in the subjects of specialization.

(c) A student who fails to obtain at least 40% in a final examination may be granted supplemental privileges only at the discretion of the Council of the Faculty of Arts.

(d) Supplemental examinations are held in late July or early August. Application for these examinations must be filed before July 1.

(e) A student may not write supplemental examinations to raise his standing in courses already passed.

(f) A student may write a supplemental once only in any one course.
ACADEMIC PROGRAMMES

1. Each student's programme must be approved by the Dean and department chairman.

2. Year I is common to both the General and Honours Courses.

Each student will choose courses from the following groups:

A. (i) English, History and Philosophy,
   (ii) French, German, Greek, Italian, Latin, Russian, Spanish, a foreign culture civilization course, Classical Civilization;

B. Economics, Geography, Political Science, Psychology, Sociology;

C. Mathematics 130, Mathematics 131, Natural Science, Religious Knowledge.

**Year I (Common to both General and Honours Programmes)**

Two subjects from Group A
Two subjects from Group B
Two other subjects

**NOTES:**

(i) A First Year Student who has indicated his intention of entering an Honours Course may postpone one of the required subjects from Group A or Group B until a later year,

(ii) In Year I a student must normally complete the introductory course in the department in which he will major in his later years,

(iii) A student who, in the opinion of the Chairman of his major department, is deficient in English may be required to take a non-credit course in remedial English.
THE GENERAL COURSE

Year I
At the end of Year I, each student in the General Course must choose one of the following subjects as his major field of study.

<table>
<thead>
<tr>
<th>Economics</th>
<th>Greek</th>
<th>Political Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>History</td>
<td>Psychology</td>
</tr>
<tr>
<td>French</td>
<td>Latin</td>
<td>Russian</td>
</tr>
<tr>
<td>Geography</td>
<td>Mathematics</td>
<td>Sociology</td>
</tr>
<tr>
<td>German</td>
<td>Philosophy</td>
<td>Spanish</td>
</tr>
</tbody>
</table>

(a) two further courses in his major subject (see notes);
(b) three other courses (see notes).

Year II (General)
Each student in Year II must choose at least five courses in consultation with his department chairman:

(a) two further courses in his major subject (see notes);
(b) three other courses (see notes).

Year III (General)
Each student in Year III must choose at least five courses in consultation with his department chairman:

(a) two further courses in his major subject;
(b) three other courses.

NOTES:
1. The programme of every student must include either
   (a) a minimum of eight courses beyond the 100 level, or
   (b) courses from no more than seven subject fields.

2. Before graduation each student must take:
   —a minimum of four courses, not all in one subject, from Group A
   —a minimum of two courses from Group A(i)
   —a minimum of one course from Group A(ii). This requirement may be met by a foreign culture civilization course or by a foreign language course. In the latter case the student must complete the course at the 100 level. Foreign language courses below the 100 level will be counted as credit for this requirement only when followed by successful completion of the 100 level course. Only one language course numbered below 100 may be used for credit towards a degree.
**HONOURS COURSES**

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

2. Before graduation each student must take:

   — a minimum of *four* courses, not all in one subject, from Group A
   
   — a minimum of *two* courses from Group A(i)
   
   — a minimum of *one* course from Group A(ii). This requirement may be met by a foreign culture civilization course or by a foreign language course. In the latter case the student must complete the course at the 100 level. Foreign language courses below the 100 level will be counted as credit for this requirement only when followed by successful completion of the 100 level course. Only one language course numbered below 100 may be used for credit towards a degree.

3. Students are requested to refer to the detailed courses of study following this page for other departmental requirements.
HONOURS ECONOMICS

Prerequisite

Students planning to enter Honours Economics should offer at least two Grade XIII papers in Mathematics, preferably Algebra and Geometry.

Year I (see page 18) Recommended Programme:

Hours

Economics 100 3
Two of English 110, History 200, Philosophy 100 6
One of French 100, German 100, Spanish 100, Russian 100, Latin 100, Greek 100, a foreign culture course 3
One of Political Science, Geography 100, Psychology 100, Sociology 100 3
One elective (see note) 3

Year II

Economics 250, 260 6
Three electives, one of which must be chosen from those subjects listed in the First Year programme in Group A 9

Year III

Economics 350, 351 (see note) and two third-year courses 12

Two electives 6

Year IV

Economics 450, 455, 470, and two of 355, 365, 375, 460 15

NOTE: It is strongly recommended that students in Year I select as their elective Mathematics 130. Students who have taken Mathematics 130 should then substitute Mathematics 233 for Economics 351 in Year III.
HONOURS ENGLISH

Prerequisite
It is desirable, but not necessary, for a student planning to enter Honours English to offer, in addition to the compulsory English, Grade XIII papers in French, German, History and Latin.

Year I (see page 18)

Recommended programme:  

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 100</td>
<td>3</td>
</tr>
<tr>
<td>One of French 100, German 100, Latin 100</td>
<td>3-4</td>
</tr>
<tr>
<td>Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td>Psychology 100</td>
<td>3</td>
</tr>
<tr>
<td>History 100</td>
<td>3</td>
</tr>
<tr>
<td>Natural Science 100 or a course in Religious Knowledge</td>
<td>4</td>
</tr>
</tbody>
</table>

Year II

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 200, 250, 260, 270, 280</td>
<td>11 1/2</td>
</tr>
<tr>
<td>Two supporting courses (see note)</td>
<td>6</td>
</tr>
</tbody>
</table>

Year III

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination on Summer Reading</td>
<td></td>
</tr>
<tr>
<td>English 350, 360, 370, 380</td>
<td>11</td>
</tr>
<tr>
<td>Classical Civilization 260</td>
<td>3</td>
</tr>
<tr>
<td>Philosophy 320</td>
<td>2</td>
</tr>
<tr>
<td>One or two supporting courses (see note)</td>
<td>3-6</td>
</tr>
</tbody>
</table>

Year IV

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination on Summer Reading</td>
<td></td>
</tr>
<tr>
<td>English 330, 450, 455, 460, 470, 495</td>
<td>13</td>
</tr>
<tr>
<td>One or two supporting courses (see note)</td>
<td>3-6</td>
</tr>
<tr>
<td>Comprehensive Examination</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Supporting courses will be chosen in light of a student's vocational and academic interests and may be selected from the following: English 225, 335, 475; foreign language or literature courses; History 210, 250, 360, 450; Philosophy courses; Psychology 240, 310; Sociology courses; and courses in Religious Knowledge.
### HONOURS

#### ENGLISH AND FRENCH

**Prerequisite**

Students planning to enter the Honours programme in English and French are advised to offer Grade XIII German, History and Latin in addition to English and French.

<table>
<thead>
<tr>
<th>Year I (see page 18)</th>
<th>Recommended programme:</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English 100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>French 100A</td>
<td>4</td>
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<tr>
<td></td>
<td>History 100 or Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>One of History 100, Philosophy 100, a course in German, Latin or Spanish</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Psychology 100 or Political Science 100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Natural Science 100 or a course in Religious Knowledge</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year II</th>
<th>English 200, 250, 360</th>
<th>7.5</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>French 250, 260</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Classical Civilization 260</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Second course in the social sciences</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year III</th>
<th>Examination on Summer Reading</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English 370, 380</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>French 350, 360, 370</td>
<td></td>
</tr>
<tr>
<td></td>
<td>History 360</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>One of English 260 (see note) or 270 or 280 or 330 or 350 or 470</td>
<td></td>
</tr>
<tr>
<td></td>
<td>further French course</td>
<td></td>
</tr>
<tr>
<td></td>
<td>History 260, 350</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a further Philosophy course or a course in Religious Knowledge</td>
<td>2-3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year IV</th>
<th>Examination on Summer Reading</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English 450, 455, 460</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>French 450, 460, 470, 480</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Philosophy 320</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Senior Honours Essay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comprehensive Examination</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Students planning to enter the Ontario College of Education must choose English 260.
HONOURS
ENGLISH AND GERMAN

<table>
<thead>
<tr>
<th>Year</th>
<th>Recommended programme</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>English 100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>German 100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>History 100 or Philosophy 100 (see note)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Psychology 100 or another social science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Two of French 100 or another language, German 250, History 100, Mathematics 130, Natural Science 100, Philosophy 100, Religious Knowledge 100J or 110R, second social science course (see note)</td>
<td>5-7</td>
</tr>
<tr>
<td>II</td>
<td>English 200, 250, 360</td>
<td>7½</td>
</tr>
<tr>
<td></td>
<td>German 250 (or, on approval 270), 260</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Two other courses (see note)</td>
<td>4-6</td>
</tr>
<tr>
<td>III</td>
<td>English 370, 380</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>German 350, 360, 370, 380</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Philosophy 320</td>
<td>2</td>
</tr>
<tr>
<td>IV</td>
<td>English 450, 455, 460</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>German 450, 460, 470</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>One other course (see note)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Senior Honours Essay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comprehensive Examination</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: Supporting courses will be chosen in light of a student’s vocational goal and academic interests, and may be chosen from the following: Classical Civilization 250, 260, 350, 370; English 260; History 100, 350, 360; Natural Science 100; Philosophy 100 and further courses in Philosophy; Religious Knowledge; other literary courses, in the original or in translation, or courses in the civilization of a country. (Students planning to enter the Ontario College of Education must include English 260 in their programme.)
**HONOURS ENGLISH AND HISTORY**

**Year I** (see page 18) 
Recommended programme:  

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 100</td>
<td>3</td>
</tr>
<tr>
<td><em>One of French 100, German 100, Latin 100</em></td>
<td>3-4</td>
</tr>
<tr>
<td>History 100</td>
<td>3</td>
</tr>
<tr>
<td><em>Three of Economics 100, Geography 100, Natural Science 100, Religious Knowledge</em></td>
<td>9-10</td>
</tr>
</tbody>
</table>

**Year II**  
English 200, 250, 360  
History 260, 360  
*One of Philosophy 100, Psychology 100*  
an advanced literature course  
7½

**Year III**  
Examination on Summer Reading  
English 3/0, 380  
*Three of History 250, 255, 350, 380*  
Geography 220, or Geography 321, or a course in Religious Knowledge  
9  
3

**Year IV**  
Examination on Summer Reading  
English 450, 455, 460  
*One or two of English 260 (see note), 270, 280, 330, 350, 470*  
3-4  
*Three of History 450, 470-79, 480*  
7-8  
Senior Honours Essay  
Comprehensive Examination

**NOTE:** Students planning to enter the Ontario College of Education must choose English 260.
**HONOURS**

**ENGLISH AND LATIN**

**Prerequisite**

Students planning to enter this course should offer Grade XIII papers in French, History, and either German or Greek, in addition to English and Latin.

**Year I (see page 18)**

<table>
<thead>
<tr>
<th>Recommended programme:</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 100</td>
<td>3</td>
</tr>
<tr>
<td>Latin 100</td>
<td>3</td>
</tr>
<tr>
<td>Two courses in the social sciences</td>
<td>6</td>
</tr>
<tr>
<td>History 100 or Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td>One elective (see note)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Year II**

| English 200, 250, 360 | 7\(\frac{1}{2}\) |
| Latin 250, 260        | 4     |
| History 255           | 3     |
| One elective (see note) | 3     |

**Year III**

| English 370, 380       | 6     |
| Latin 350, 360, 370    | 7     |
| Philosophy 320         | 2     |
| One elective (see note) | 3     |

**Year IV**

| English 450, 455, 460  | 7     |
| Latin 450, 460, 470    | 7     |

*One of Classical Civilization 350 or 360

English 260* or 270 or 280 or 330

or 470, further course in Philosophy

2–3

Senior Honours Essay

* Students planning to enter the Ontario College of Education must choose English 260.

**NOTE:** Before graduation a student will be expected to complete Natural Science 100.
<table>
<thead>
<tr>
<th><strong>HONOURS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENGLISH AND PHILOSOPHY</strong></td>
</tr>
</tbody>
</table>

**Year I** (see page 18)  
Recommended programme:  

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 100</td>
<td>3</td>
</tr>
<tr>
<td>One of French 100, German 100, Latin 100, Greek 100</td>
<td>3–4</td>
</tr>
<tr>
<td>Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td>Psychology 100 or Political Science 100</td>
<td>3</td>
</tr>
<tr>
<td>Natural Science 100</td>
<td>4</td>
</tr>
<tr>
<td>One of History 100 or foreign language course</td>
<td>3–4</td>
</tr>
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</table>

**Year II**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 200, 250, 360</td>
<td>7 1/2</td>
</tr>
<tr>
<td>Philosophy 200, 210, 250</td>
<td>7</td>
</tr>
<tr>
<td>One of Classical Civilization 260, Psychology 100, Political Science 100, or a course in Religious Knowledge</td>
<td>3</td>
</tr>
</tbody>
</table>

**Year III**  

Examination on Summer Reading  

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 370, 380</td>
<td>6</td>
</tr>
<tr>
<td>Philosophy 300, 320, 340</td>
<td>7</td>
</tr>
</tbody>
</table>

**Year IV**  

Examination on Summer Reading  

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 450, 455, 460</td>
<td>7</td>
</tr>
<tr>
<td>Philosophy 310, 450, 451</td>
<td>6</td>
</tr>
<tr>
<td>One of English 260, 270, 280, 330, 350, 470, Philosophy 452, 453, 454, 455</td>
<td>2–3</td>
</tr>
</tbody>
</table>

Senior Essay  
Comprehensive Examination
### HONOURS
**ENGLISH AND SPANISH**

**Prerequisite**

Students planning to enter the honours programme in English and Spanish are advised to offer Grade XIII History and Latin in addition to English and French. Those who begin Spanish in the University will take Spanish 1-50 in the first year, and Spanish 100, 250 and 260 in the second year.

**Year I (see page 18)**

<table>
<thead>
<tr>
<th>Recommended programme:</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 100</td>
<td>3</td>
</tr>
<tr>
<td>French 100</td>
<td>4</td>
</tr>
<tr>
<td>Spanish 100</td>
<td>4</td>
</tr>
<tr>
<td>History 100 or Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td>Psychology 100 or Political Science 100</td>
<td>3</td>
</tr>
<tr>
<td>Natural Science 100 or a course in Religious Knowledge</td>
<td>4</td>
</tr>
</tbody>
</table>

**Year II**

| English 200, 250, 360                                         | 7½    |
| Spanish 250, 260                                              | 6     |
| Classical Civilization 260                                    | 3     |
| Second course in the social sciences                          | 3     |

**Year III**

| Examination on Summer Reading                                 |       |
| English 370, 380                                              | 6     |
| Spanish 350, 360, 370                                         | 7     |
| History 360                                                  | 3     |

*One of English 260 (see note), 270, 280, 330, or 470 further French course
History 260 or 350
Further Philosophy course
Further Spanish course

| 2-3                                                          |

**Year IV**

| Examination on Summer Reading                                 |       |
| English 450, 455, 460                                         | 7     |
| Spanish 450, 460, 470, 480                                    | 8     |
| Philosophy 320                                               | 2     |
| Senior Honours Essay                                         |       |
| Comprehensive Examination                                    |       |

**NOTE:** Students planning to enter the Ontario College of Education must choose English 260.

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HONOURS
FRENCH AND GERMAN

Year I (see page 18)  Recommended Programme:  Hours
French 100  4
German 100  3
Two of History, English, Philosophy  6
One course in the social sciences  3
One elective (see note 1)  3

Year II  French 250, 251, 260, and a course in German  9
German 260, and one of 250, 270  6
Two electives  6

Year III  French 350, 360, 370  7
German 350, 360, 370, 380  11
One elective  3

Year IV  French 450, 460, 470, 480  8
German 450, 460, 470  7
One elective (see note 2)  3
Comprehensive Examination

NOTE: Each student will normally complete a minimum of at least one course from each of English, History and Philosophy.

1. The student may take the two required Social Sciences in the first year.

2. Required if the student would not otherwise have fulfilled the required minimum number of courses.
# Honours French and Latin

## Year I (see page 18)

**Recommended Programme:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin 100</td>
<td>3</td>
</tr>
<tr>
<td>French 100A</td>
<td>4</td>
</tr>
<tr>
<td>Two courses in the social sciences</td>
<td>6</td>
</tr>
<tr>
<td>English 110 or History 200</td>
<td>3</td>
</tr>
<tr>
<td>One elective</td>
<td>3</td>
</tr>
</tbody>
</table>

## Year II

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin 250, 251, 260</td>
<td>4</td>
</tr>
<tr>
<td>French 250, 260</td>
<td>6</td>
</tr>
<tr>
<td>Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td>One elective</td>
<td>3</td>
</tr>
</tbody>
</table>

## Year III

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin 350, 360, 370</td>
<td>7</td>
</tr>
<tr>
<td>French 350, 360, 370</td>
<td>7</td>
</tr>
<tr>
<td>One elective</td>
<td>3</td>
</tr>
</tbody>
</table>

## Year IV

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin 450, 460, 470</td>
<td>7</td>
</tr>
<tr>
<td>French 450, 460, 470, 480</td>
<td>8</td>
</tr>
</tbody>
</table>
HONOURS 
FRENCH AND RUSSIAN

Prerequisite
Students entering Honours French and Russian are strongly advised to offer Grade XIII Latin or German, or Russian, where possible, as well as French.

Year I (see page 18) Recommended Programme:  
French 100A  4
Russian 1-50 or 100  3
Two of History, English, Philosophy  6
One course in the social sciences  3
One elective (see note 1)  3

Year II
French 250, 251, 260, and a course in Russian  9
Russian 260 or 100 and one of 250, 370  6
Two electives  6

Year III
French 350, 360, 370  7
Russian 350, 360, 370, 470  11
One elective  3

Year IV
French 450, 460, 470, 480  8
Russian 450, 460, 480  7
One elective (see note 2)  3
Comprehensive Examination

NOTE: Each student will normally complete a minimum of at least one course from each of English, History and Philosophy.

1. The student may take the two required Social Sciences in the first year.

2. Required if the student would not otherwise have fulfilled the required minimum number of courses.
# HONOURS FRENCH AND SPANISH

## Prerequisite
Students registering in Honours French and Spanish must present satisfactory standing in Grade XIII English, French, and Latin. Those who begin Spanish in the University will take Spanish 1–50 in the first year, and Spanish 100, 250 and 260 in the second year.

## Year I (see page 18)
**Recommended Programme:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>French 100A</td>
<td>4</td>
</tr>
<tr>
<td>Spanish 100</td>
<td>4</td>
</tr>
<tr>
<td>Latin 100 or Italian 12J</td>
<td>3</td>
</tr>
<tr>
<td>Two courses in the social sciences</td>
<td>6</td>
</tr>
<tr>
<td>One elective</td>
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</table>

## Year II

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>French 250, 251, 260</td>
<td>6</td>
</tr>
<tr>
<td>Spanish 250, 260</td>
<td>6</td>
</tr>
<tr>
<td>History 260</td>
<td>3</td>
</tr>
<tr>
<td>Italian 50J (for those who took 12J) or one elective</td>
<td>3</td>
</tr>
</tbody>
</table>

## Year III

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>French 350, 360, 370</td>
<td>7</td>
</tr>
<tr>
<td>Spanish 350, 360, 370</td>
<td>7</td>
</tr>
<tr>
<td>English 380</td>
<td>3</td>
</tr>
</tbody>
</table>

## Year IV

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>French 450, 460, 470, 480</td>
<td>8</td>
</tr>
<tr>
<td>Spanish 450, 460, 470, 480</td>
<td>8</td>
</tr>
</tbody>
</table>

**NOTE:** Students taking Honours courses involving French and/or Spanish are required to read, independently, a number of books dealing with the history and culture of France and/or Spain and Spanish America, and will be examined on the assumption that the reading has been done.
**HONOURS GEOGRAPHY**

**TEACHING OPTION**

**Prerequisite**

It is desirable, but not essential, that a student enter Honours Geography with Grade XIII Geography and History.

**Year I** (see page 18)

<table>
<thead>
<tr>
<th>Recommended Programme:</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geography 100</td>
<td>4</td>
</tr>
<tr>
<td>One of French 100, German 100, Spanish 100, Russian 100</td>
<td>4</td>
</tr>
<tr>
<td>History 100</td>
<td>3</td>
</tr>
<tr>
<td>Economics 100</td>
<td>3</td>
</tr>
<tr>
<td>Geology 130</td>
<td>4</td>
</tr>
<tr>
<td>One additional course other than Geography</td>
<td>3</td>
</tr>
</tbody>
</table>

**Year II**

| Geography 200, 210, 220 | 12 |
| Three additional courses other than Geography | 9 |

**Year III**

| Examination on Summer Reading | 8 |
| Geography 300, 360 | |
| One of Geography 341, 421-429, one course from Group A or B | 3 |
| Three of Geography 345, 350, 355, one course from Group A or B | 10–12 |

**Year IV**

| Examination on Summer Reading | 13–14 |
| Geography 420, 421-429, 460, 480, 490 | |
| One of Geography 450, one additional course other than Geography | 3 |

**NOTES:**

1. To qualify for the Ontario Type A certificate students must take two History courses. Geography 490 allows those students intending to proceed to teaching to replace the Senior Honours Essay with an appropriate research project related to teaching.

2. At least one course in YEAR III must be chosen from outside the field of Geography. This programme is designed to permit students to enter Secondary School teaching or to continue to graduate work in Geography.

3. Students will consult with the Department of Geography to ensure that their programme and selection of courses is sound.
HONOURS GEOGRAPHY
URBAN, REGIONAL, AND RESOURCE PLANNING OPTION

Prerequisite: It is desirable, but not essential, that a student enter Honours Geography with Grade XIII Geography and History.

Year I (see page 18)  Recommended Programme:  Hours
Geometry 100  4
One of French 100, German 100, Spanish 100, Russian 100  4
Economics 100  3
Geology 130  4
One of Political Science 100, Sociology 100, Mathematics 130, Psychology 100  3
One of History 100, Philosophy 100, English 100, English 110  3

Year II
Geometry 200, 210, 220  12
Sociology 260  3
One of Economics 351, Mathematics 233  3
One course from the subjects listed in Group A  3

Year III
Geometry 300, 350, 355, 356, 360  18
One course from the subjects listed in Group A  3

Year IV
Geometry 456, 460, 480, 490  10–11
One of Geography 345, 420, 421-429, 450  3
One of Political Science 405, one additional course other than Geography  3

NOTES: 1. This programme is designed for students who intend to do graduate work in Geography and/or Planning, or who intend to go directly into research work with planning agencies, government or business.

2. Students will consult with the Department of Geography to ensure that their programme and selection of courses is sound.
# Honours German and Russian

<table>
<thead>
<tr>
<th>Year</th>
<th>Recommended Programme</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year I</strong></td>
<td>German 100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Russian 1-50 or 100</td>
<td>5–3</td>
</tr>
<tr>
<td></td>
<td><em>Two of History, English, Philosophy</em></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>One course in the social sciences</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>One elective (see note 1)</td>
<td></td>
</tr>
<tr>
<td><strong>Year II</strong></td>
<td>German 260 and one of 250, 270</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Russian 260 or 100 and one of 250, 270</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Two electives</td>
<td>6</td>
</tr>
<tr>
<td><strong>Year III</strong></td>
<td>German 350, 360, 370, 380</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Russian 350, 360 or 260 and one of 370, 470</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>One elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>Year IV</strong></td>
<td>German 450, 460, 470</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Russian 450, 460, 470, 480</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>One elective (see note 2)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Comprehensive Examination</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Each student will normally complete a minimum of at least one course from each of English, History and Philosophy.

1. The student may take the two required Social Sciences in the first year.

2. Required if the student would not otherwise have fulfilled the required minimum number of courses.
HONOURS HISTORY

Prerequisite
It is desirable, but not necessary, for a student planning to enter Honours History to offer Grade XIII papers in foreign languages and Geography in addition to English and History.

Year I (see page 18)
Recommended Programme:

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 100 or 110</td>
<td>3</td>
</tr>
<tr>
<td>One of French 100, German 100, Spanish 100, Latin 100, (or an acceptable alternative language)</td>
<td>3</td>
</tr>
<tr>
<td>History 100</td>
<td>3</td>
</tr>
<tr>
<td>Two of Economics 100, Geography 100, Political Science 100</td>
<td>6</td>
</tr>
<tr>
<td>Philosophy 100</td>
<td>3</td>
</tr>
</tbody>
</table>

Year II

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>History 299</td>
<td>1</td>
</tr>
<tr>
<td>Two of History 250, 255, 260, 350, 360, 370, 380</td>
<td>6</td>
</tr>
<tr>
<td>One of History 270, 275, 260, 285, 290</td>
<td>3</td>
</tr>
<tr>
<td>One of Natural Science 100, English 200</td>
<td>3</td>
</tr>
<tr>
<td>Two of English 200, Geography 220, 222, Philosophy, Political Science 220, Psychology 240, Religious Knowledge</td>
<td>6</td>
</tr>
</tbody>
</table>

Year III

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination on Summer Reading</td>
<td></td>
</tr>
<tr>
<td>Three of History 250, 255, 260, 350, 360, 370, 380</td>
<td>9</td>
</tr>
<tr>
<td>Three of Humanistic and/or social scientific subjects (see note 1), Natural Science 100 (if not previously taken)</td>
<td>9</td>
</tr>
</tbody>
</table>

Year IV

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examination on Summer Reading</td>
<td></td>
</tr>
<tr>
<td>History 499 and two of 470-479</td>
<td>5</td>
</tr>
<tr>
<td>Three of History 450, 460, 462, 465, 480</td>
<td>9</td>
</tr>
<tr>
<td>or approved alternative senior courses (see note 2)</td>
<td></td>
</tr>
<tr>
<td>Comprehensive Examination</td>
<td></td>
</tr>
</tbody>
</table>

NOTES: 1. Where a sequence has not been completed in both the humanities and social sciences in addition to History, it should be completed in Year III.
2. Such alternative senior courses may be chosen from Economics, History, Geography, Philosophy, Political Science.
3. (a) Graduation in this course with at least Second Class Honours standing qualifies a student for admission to the Type A course in History at the Ontario College of Education, provided that History 255, and at least two of Geography 100, 210, and 220 are taken.
(b) Students intending to proceed to Secondary School teaching in History should consult with the Department of History to ensure that their choice of supporting courses is sound.
HONOURS MATHEMATICS

Prerequisite

Students entering this programme should have an over-all average of 66% in the Grade XIII examinations in Mathematics (Algebra, Geometry, and Trigonometry); it is also desirable to have taken Grade XIII Chemistry and Physics. To remain in the Honours Mathematics programme, a student must obtain an over-all average of 60% in each year.

Year I (see page 18)  Recommended Programme:  Hours
Mathematics 130, 131  6
Four other courses, one of which may be Mathematics 132

Year II
Mathematics 230, 231, 232, 233  11
Three electives, one of which may be chosen from Mathematics 234, 235  8

Year III  (Pure Mathematics Option)
Mathematics 330, 331, 332, 333  10
Two additional Mathematics courses  4
Two electives  6

(Statistics and Actuarial Mathematics Option)
Mathematics 331, 332, 334, 335  11
Two courses chosen from Mathematics 330, 333, 336, 338  4
Two electives  6

(Teaching Option)
Mathematics 330, 331, 332, 334  12
One additional Mathematics course  2
Two electives  6

Year IV  (Pure Mathematics Option)
Mathematics 430, 431, 432, 433, 434  10
One additional Mathematics course  2
Two electives  6

(Statistics and Actuarial Mathematics Option)
Mathematics 435, 438  5
One of Mathematics 433, 437  1
Three courses from Mathematics 430, 436, 439, 440, 446, 447  6
Two electives  6

(Teaching Option)
Mathematics 446  2
Four additional Mathematics courses numbered above 200  12
Two electives

NOTE: 1. Each student will normally include two courses in Physical Science among the elective courses of the second, third, and fourth years.

2. Students may choose their elective courses so as to have a minor field of specialization in addition to Mathematics; for example, Psychology, Economics, German, French, etc., could serve as minors. With the permission of the Dean and the Department Chairman, students may replace one of the Mathematics courses of each of the third and fourth years by a course chosen from the minor field.
**HONOURS MATHEMATICS AND PHILOSOPHY**

**Year I (see page 18)**

<table>
<thead>
<tr>
<th>Recommended Programme:</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 100</td>
<td>3</td>
</tr>
<tr>
<td>Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td>A foreign language</td>
<td>3</td>
</tr>
<tr>
<td>One course in the social sciences</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics 130, 131</td>
<td>6</td>
</tr>
</tbody>
</table>

**Year II**

| Mathematics 230, 231, 232                   | 8     |
| Philosophy 200, 210                         | 6     |
| Elective                                    | 3     |

**Year III**

| Mathematics 330, 332, 233, 234              | 10    |
| Philosophy 300, 220                         | 6     |
| *One of Philosophy* 310, 320, 330, 340      | 2     |

**Year IV**

| Mathematics 331, 337, 433, 446              | 7     |
| Philosophy 499                              | 1     |
| *Two of Philosophy* 450-457                 | 4     |
| Elective (may be another Math.)             | 2-3   |

**HONOURS PHILOSOPHY**

**Year I (see page 18)**

<table>
<thead>
<tr>
<th>Recommended Programme:</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td>English</td>
<td>3</td>
</tr>
<tr>
<td><em>One of French</em> 100, German 100, Latin 100,</td>
<td>3</td>
</tr>
<tr>
<td>or Greek 100</td>
<td></td>
</tr>
<tr>
<td><em>One of Psychology</em> 100, Sociology 100</td>
<td>3</td>
</tr>
<tr>
<td><em>Two of Mathematics</em> 130, Mathematics 131,</td>
<td>6</td>
</tr>
<tr>
<td>Political Science 100, or Economics 100</td>
<td></td>
</tr>
<tr>
<td>or Geography 100</td>
<td></td>
</tr>
<tr>
<td>History 100</td>
<td></td>
</tr>
<tr>
<td>A Natural Science</td>
<td></td>
</tr>
<tr>
<td>Another language</td>
<td></td>
</tr>
</tbody>
</table>

**Year II**

| Philosophy 200, 210, 250                    | 7     |
| Three other courses, one of which should be | 9     |
| in the general area of the humanities      |       |

**Year III**

| Philosophy 300, 220                         | 6     |
| *Two of Philosophy* 310, 320, 330, 340      | 4     |
| Two electives                               | 6     |

**Year IV**

| Philosophy 450 or 460                       | 2     |
| Philosophy 470, 499                         | 2     |
| *Three of Philosophy* 451, 452, 453, 454,  | 6     |
| 455, 456, 457                               |       |
| One elective                                | 3     |
HONOURS PHILOSOPHY  
AND LITERATURE

Year I (see page 18)  Recommended Programme:  Hours
Philosophy 100  3
French 100A (or German 100)  3
English*  3
A Social Science  3
Two of A Natural Science
  Mathematics
  History
  Another language**
  Another Social Science  6

Year II  Philosophy 200, 210, 250 (tutorial)  7
French 250, 260 (or German 260 and one of
  German 250, 270)  5–6
One elective (Social Science, if requirement not
  met in first year)  3

Year III  Philosophy 300  3
Two of Philosophy 310, 320, 330, 340  4
French 350, 360, 370
  (or German 350, 360, 380)  7
One elective  3

Year IV  Three courses in Philosophy, one of which may be
  one from the 300 level  6
French 450, 460, 470, 480
  (or German 450, 460, 470)  8
Senior Essay

* In certain special cases, where the student can prove a high degree of familiarity
  with English Literature he may substitute French or German 100, whichever has not
  already been chosen.

** Those taking the French option should normally take Latin 100.
## HONOURS POLITICAL SCIENCE

<table>
<thead>
<tr>
<th>Year</th>
<th>Requirements</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year I</strong></td>
<td>Political Science 110</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><em>One of:</em> Economics 100, Psychology 100, Sociology 100, Geography 100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><em>One of:</em> History 100, another approved History course, Philosophy 100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><em>One of:</em> English 110, a Foreign Language, a Foreign Culture Course</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Two other courses to be selected in consultation with the Department</td>
<td>6</td>
</tr>
<tr>
<td><strong>Year II</strong></td>
<td>Three Political Science courses at the 200 level selected in consultation with the Department</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>An approved course in History, Philosophy or Economics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Two other courses, at least one of which must be a subject taken in Year I</td>
<td>6</td>
</tr>
<tr>
<td><strong>Year III</strong></td>
<td>Four Political Science courses selected in consultation with the Department</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Two other approved courses</td>
<td>6</td>
</tr>
<tr>
<td><strong>Year IV</strong></td>
<td>Five Political Science courses, at least three of them at the 400 level</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>One other approved course</td>
<td>3</td>
</tr>
</tbody>
</table>
HONOURS PSYCHOLOGY

**Year I** (see page 18)  
**Recommended Programme:**  
- Two courses from Group A (see note 1)  
- Two courses from Group B, one of which must be Psychology 100  
- Biology (see note 2)  
- Mathematics 130 (see note 3)  

<table>
<thead>
<tr>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

**Year II**  
- Psychology 210, 220 and one of 230, 240  
- One course from Group A (see note 1)  
- Two courses from Groups B and C (see notes 2 and 3)  

<table>
<thead>
<tr>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

**Year III**  
- Psychology 310, 320 and one of 340, 350  
- One course from Group A (see note 1)  
- Two courses from Groups B and C (see notes 2 and 3)  

<table>
<thead>
<tr>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

**Year IV**  
- Psychology 410, 440 and one of 420, 430  
- Three courses from Groups A, B, and C  

<table>
<thead>
<tr>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
</tr>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

**NOTES:**  
1. Students planning graduate studies should include a language other than English in their undergraduate programme.  
2. All students will complete at least one course in Biology. If Biology has not been studied in High School the Course taken must be Biology 131. Other recommended courses are: Biology 236, Zoology 231 and Zoology 232.  
3. All students will take a course in Statistics: by way of preparation for this course, Mathematics 130 must be taken and Mathematics 236 is advised. The Mathematics courses will normally be taken in Years I and II but may be delayed.
OTHER HONOURS COURSES

Students interested in taking Honours Courses or combination of courses not listed in the preceding pages should consult with the Dean.

Other Honours Courses which may be offered, should the demand be sufficient are:

HONOURS CLASSICS
HONOURS ECONOMICS (with Mathematics Option)
HONOURS ECONOMICS AND POLITICAL SCIENCE
HONOURS HISTORY AND PHILOSOPHY
HONOURS LATIN AND GREEK
HONOURS PSYCHOLOGY AND SOCIOLOGY

AREA STUDY PROGRAMMES

In certain Honours Courses, students may choose to place greater emphasis on one part of the world than on others. Students who are taking Honours Courses in History, Political Science, Economics or Geography, for example, may wish to concentrate on the application of these subjects to Latin America, Africa or the Soviet Union. In these cases students may, with the permission of the Department Chairman concerned, arrange to take courses related to the area in which they are particularly interested.
III

THE FACULTY

OF

ENGINEERING
THE CO-OPERATIVE ENGINEERING COURSE

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 Course at the University of Waterloo provides a completely integrated pattern of academic study and industrial experience in various phases of engineering. The degree course covers almost five calendar years, comprising eight terms each of about four months' duration of university work on the campus which are pursued alternately with six four-month terms of organized and supervised training in engineering practice. The total time spent in study is the same as that encountered in the usual course of four "academic years". Waterloo's Co-operative Engineering Course is unique in Canada; many co-operative courses are offered in other countries, and the advantages of such programmes have been widely recognized.

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 course is common for all programmes, as is a substantial part of the work of the second year. Starting with the second year, students elect one of the four principal divisions of engineering. The curriculum for each of the four 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.

An optional Pre-Engineering Year, not on the co-operative basis, is available to students with satisfactory standing at the Grade XII level who are unable to obtain Grade XIII standing, or the equivalent, in the normal manner.

The co-operative course brings a student into direct contact with the engineering profession and exposes him to problems typical of those encountered in practice. Students are introduced to full-scale engineering projects and installations, far beyond the scope of any university laboratory. Arrangements for work assignments are made through the Co-ordination Department of the University, which provides a liaison between campus and industry. Through directed experience in industry, the student's educational environment is extended and his total education advanced. The co-operative experience represents much more than an opportunity to secure financial assistance, or to make an early start on 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 their technical ability, are prepared for individual responsibility and have a clear understanding of the relationship of their profession to industry and society.
The Degree of Bachelor of Applied Science (B.A.Sc.) is awarded by the University in the following undergraduate courses:

- CHEMICAL ENGINEERING
- CIVIL ENGINEERING
- ELECTRICAL ENGINEERING
- MECHANICAL 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 four main programmes. All courses entail five years of undergraduate study on the co-operative programme. A Pre-Engineering Year is offered to certain students who are not able to secure the admission requirements for Year I in the usual manner.

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 section of this calendar dealing with the Faculty of Graduate Studies.

### Co-operative Programme

The eight terms of study and six terms of industrial employment provided in the course are arranged as shown in the diagram below:

<table>
<thead>
<tr>
<th>Stream</th>
<th>1963</th>
<th>1964</th>
<th>1965</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Winter</td>
<td>Spring</td>
</tr>
<tr>
<td>&quot;A&quot;</td>
<td>First</td>
<td>Second</td>
<td>Work</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>Term</td>
<td>Period</td>
</tr>
<tr>
<td>&quot;B&quot;</td>
<td>First</td>
<td>Work</td>
<td>Second</td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td>Period</td>
<td>Term</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>1966</th>
<th>1967</th>
<th>1968</th>
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<tbody>
<tr>
<td>Winter</td>
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<td>Winter</td>
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<td>Winter</td>
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</tbody>
</table>

All Year I students enrol in September. These Year I students spend the first term together at the University, and, as indicated on the diagram, also complete the course and graduate together. Between the first and last terms, the diagram shows that each class is split into two approximately equal groups for continuity of employment opportunity on 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 division at the end of 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 on page 220 with the calendar for the year.
ADMISSION AND REGISTRATION

General

Application for admission to the Faculty of Engineering should be made, as early in the year as possible, on forms provided by the Office of the Registrar. Academic certificates (not diplomas) and other supporting documents should be forwarded as soon as they become available.

Students may enter the Engineering course at one of two levels; either at the Pre-Engineering Year or Engineering Year I. Admission cannot be granted until all requirements have been met and all documents submitted.

Admission to the Pre-Engineering Year

In order to qualify for entry to the Pre-Engineering Year, a candidate must have completed the requirements for an Ontario Secondary School Graduation Diploma (Grade XII) or its equivalent, showing a minimum over-all average of 66% and evidence of proficiency in Mathematics and Science.

The following academic certificates, recognized as being equivalent to the Ontario Secondary School Graduation Diploma (Grade XII), may be accepted insofar as they meet the admission requirements of the University of Waterloo in subjects and percentages:

- Alberta
- British Columbia
- Manitoba
- New Brunswick
- Newfoundland
- Nova Scotia
- Prince Edward Island
- Quebec
- Saskatchewan
- United States of America

NOTE: The Pre-Engineering Year is offered during the conventional academic year (September to May), and is not part of the Co-operative programme.
Admission to Engineering Year I

In order to qualify for admission to Engineering Year I, the applicant must have completed the requirements for the Ontario Secondary School Honour Graduation Diploma (Senior Matriculation), or its equivalent, showing an overall average of 60% in nine Grade XIII papers, with a minimum of 60% in the five papers required in Mathematics and Science. Standing is required in the following subjects:

- English (Composition and Literature)
- Mathematics (Algebra, Geometry, Trigonometry)
- Science (Chemistry, Physics)
- Two additional papers.

Additional papers can be selected from any of the optional subjects offered at the Grade XIII level with the qualification that no more than one of the following papers may be counted as an "additional" paper: Accountancy Practice, Secretarial Practice, Mathematics of Investment, Art or Music (Departmental Examination). The marks received in one of these papers will be included in the computation of the applicant's average. Standing with the Royal Conservatory of Music in Grade VIII practical and Grade II theory will be considered one 'additional paper' on the same terms as the above list except the marks received will not be computed in the average.

The following certificates, recognized as being equivalent to the Ontario Grade XIII certificate, may be accepted insofar as they meet the admission requirements of the University of Waterloo in subjects and percentages:

- Alberta: Senior Matriculation (Grade XII)
- British Columbia: Senior Matriculation (Grade XIII)
- Manitoba: Senior Matriculation (Grade XII)
- New Brunswick: Senior Matriculation (Grade XII)
- Newfoundland: Year I Memorial University
- Nova Scotia: Senior Matriculation (Grade XII)
- Prince Edward Island: Third Year Certificate from Prince of Wales College
- Quebec: McGill Senior Matriculation or Quebec Senior High School Leaving Certificate
- Saskatchewan: Senior Matriculation (Grade XII)
- England and Wales: The General Certificate of Education with passes in at least five subjects, two of which must be at Advanced Level. Advanced Level subjects must include Mathematics and either Physics or Chemistry
- Scotland: The Scottish Leaving Certificate
- United States of America: High School Graduation plus an additional year of formal study in subjects comparable to Ontario Grade XIII
Admission to Advanced Standing

An applicant for admission to advanced standing must submit an official transcript from the University which he has attended, showing in detail the courses he has taken and his standing in each.

Admission as an Adult Student

Any student of mature age who has been away from formal education for more than two years, and who does not possess the minimum requirements for admission, may apply to enter as an adult student. Each application will be considered on its merits by the Admissions Committee. Under certain circumstances, the applicant may be required to write a qualifying examination.

Admission of Students from Other Countries

Students from areas where English is not the common language must provide certified translations of academic certificates. In addition, the applicant may be required to take either “The English Proficiency Tests” prepared by the English Language Institute of the University of Michigan, or the examinations for “The Certificate of Proficiency in English” of the University of Cambridge, in order to satisfy the Admissions Committee that his knowledge of the English language is adequate to pursue his studies successfully. The expenses involved in administering the test must be borne by the applicant.

Re-Admission

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.

Registration

Registration for all Pre-Engineering and First Year students will be held on Thursday, September 5, 1963.

The Pre-Engineering Year is offered during the conventional academic year (September to May), and is not part of the Co-operative programme. Information for students in other years is included on page 48 “Co-operative Programme.”

Once the student has completed his registration, he may not change his course, add subjects, or drop subjects, without obtaining permission from the Dean, the instructor, and obtaining the necessary course card from the Office of the Registrar.
FEES

All fees for the academic year are due and payable on the day of registration. Credit for scholarships or bursaries are given only on the authority of the Registrar after presentation of proof of the award. If, for reasons acceptable to the Business Manager, the fees for the year cannot be paid in full on the day of registration, they may be paid in two instalments, but an extra charge of $5.00 will then be added to the total fee.

The first instalment, to be paid on the day of registration, is a minimum of 60% of tuition, plus other fees. Pre-Engineering students must pay the balance in full on or before the first day of the second term. All other students must pay the balance on or before the sixth week of term.

A charge of $2.00 per month will be made on overdue accounts. Failure to pay an overdue account before conclusion of lectures, will bar a student from writing examinations or obtaining credit for previous work.

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 may entitle him to a refund of a portion of his fees. No fees will be refunded unless this procedure is followed.

Refunds of tuition fees are made at the discretion of the University.

Incidental fees are not refundable.

<table>
<thead>
<tr>
<th>Fees</th>
<th>Pre-Engineering Year One (Per Year)</th>
<th>Engineering Other Years (Per Term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition</td>
<td>$510.00</td>
<td>$305.00</td>
</tr>
<tr>
<td>Includes registration and regular examination fees.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Insurance</td>
<td>6.50*</td>
<td>6.50*</td>
</tr>
<tr>
<td>For Co-operative Engineering Students, the Health Insurance Fee is for 8 months' protection following each registration, and therefore includes students while off campus in their work periods. For Pre-Engineering students, coverage commences on the day of registration and terminates at the close of the academic year. This plan does not include the premiums or benefits of the Ontario Hospital Services Commission. Ontario Hospital Services coverage is the student's own responsibility.</td>
<td>6.50*</td>
<td></td>
</tr>
<tr>
<td>Student Activities</td>
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</tr>
<tr>
<td>Student Societies</td>
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<tr>
<td>Student Publications</td>
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<tr>
<td>Athletics</td>
<td>14.00</td>
<td>7.00</td>
</tr>
<tr>
<td>Music</td>
<td>1.00</td>
<td>.50</td>
</tr>
</tbody>
</table>

* (8 months)
Examinations

Supplemental—each paper $10.00
Special Examination—each paper 15.00
Presiding fee (at an outside centre, each half day) 5.00

Miscellaneous Fees

Late Registration 10.00
Transcript of Record 1.00
Degree and Graduation (final year only) 10.00

The Board of Governors reserves the right to make changes in its published schedule of fees without notice.
EXAMINATIONS AND PROMOTIONS

The Faculty constitutes the examining body for all University examinations.

The arrangement of the undergraduate engineering programme is shown on page 48. The first two terms or semesters comprise the "First Year" and courses in the first year extend over the full two terms, with final examinations at the end of the second term. Beyond the first year, all courses are of single term duration, and final examinations are held at the end of each term.

The following regulations govern the conduct of examinations and the promotions policy of the Faculty of Engineering of the University.

1. All examination results are considered by the Faculty Committee on Examinations and Promotions 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.

2. Standings in individual subjects are indicated by numerical grades in the scale 0 to 100, and may be interpreted according to the following:

- 85–100 Excellent
- 75–84 Very Good
- 66–74 Good, Above Average
- 60–65 Fair, Average to Below Average
- 50–59 Passing
- Below 50 Failing

3. For promotion from the First Year an over-all average of 60% is required. Students failing to secure this average will be required to repeat the year except that if, in the opinion of the Faculty Council, a student is deemed unlikely to profit from further study, readmission will be denied.

4. For promotion in the third and subsequent terms an over-all average of 60% is required in the work of the term. Students failing to secure this average normally will be required to repeat all or part of the work of the term last completed.

Where timetables permit, repeating students may be excused from repeating individual courses in which satisfactory grades have been obtained, and permitted to register in other appropriate courses.
5. Overall averages of grades or standings may be interpreted according to the following:

- 75.0–100 First Class Honours
- 66.0–74.9 Second Class Honours
- 60.0–65.9 Third Class Honours
- Conditional—(Supplemental Examinations Required)

6. A student must obtain an average standing of 60% as defined in sections 2 or 3 above to qualify for the privilege of writing supplemental examinations. Supplemental examinations will be written in the term immediately following that in which the respective final examinations were written. The results of supplemental examinations are reported and recorded but do not affect the original standing as used in determining averages for promotion. A student may not write supplemental examinations to raise the standing in subjects already passed.

7. No student will be permitted to continue in course if he fails a supplemental examination in a course which is required as a prerequisite for further study, except with the express approval of the Examinations and Promotions Committee and the Department in which he is registered. Where a necessary prerequisite subject has not been cleared, a student may either repeat the year or term, or remain out of course until the deficiency is cleared at a subsequent examination.

8. If a student has failed to clear the supplemental examination in a single subject not required as a prerequisite for further study, he may be permitted to continue in course for one year, but must clear the condition before proceeding further.

9. Failure to write an examination is considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, has no supplemental examination privilege. Doctors' certificates, or other documents indicating reasons for absence from examinations must be filed in the Office of the Registrar by the last day of examinations.

10. Final examinations are automatically re-read for all subjects in which failing grades are assigned. Great care is taken not to make errors in assigning and recording grades.

11. A student may not repeat a given year more than once. Degree requirements must be fulfilled in not more than 11 terms of resident study.

12. Any student may be required to withdraw at any time, if, in the opinion of the Faculty Council, he is unlikely to profit from further study.
A basic requirement of the Co-operative Programme at the University of Waterloo is the satisfactory performance of co-operative work assignments in industry. These assignments afford the student the opportunity of gaining practical experience as a complement to his academic studies. In addition, they aid in developing proper attitudes towards work and self-discipline.

Although the Co-ordination Department does not guarantee placement of students in industry, every effort is made to ensure that appropriate employment is made available. Representatives of industry interview interested candidates on the campus but in all instances, the responsibility for completing any employment arrangement rests with the student. The experience obtained in dealing with industry is a fundamental part of the students' co-operative education.

All positions held by students must be approved by the Co-ordination Department in order to be considered as part of the required co-operative work assignments. Registration in the Co-operative Course implies that the student will accept work assignments wherever the best interests of his training programme are served in the opinion of the Department. The Department is not responsible for assisting in the placement of students required to repeat an academic term, until evidence of the successful completion of such term has been received.
During his early years in the course, the student's work assignments teach him the importance of being co-operative, industrious, and punctual in his daily work. Consequently, although his initial assignments may not necessarily be related to the work done by professional personnel, he is provided with an increasing opportunity to gain experience in his chosen field as he progresses through the course.

Remuneration is in accordance with prevailing wage policies of the individual companies, and depends on the nature of the work being performed by the student. Wages can be expected to increase as the student progresses through the course and assumes more responsibility. However, the student should not ordinarily expect the income from his work periods to make him completely self-supporting.

A work report written by the student and covering each co-operative work assignment must be presented to, and approved by, the employing company two weeks prior to the end of each term of his employment. This report must then be submitted to the University. These reports serve a dual purpose. Experience is gained in the preparation of written reports similar to those which an employer expects from a responsible subordinate. In addition, the necessity of gathering material for such a report will develop in the student a thorough appreciation of job analysis. In effect, the work report is designed to help train the student to think, to organize, and to express himself on paper in a clear, logical, and concise form.

No student may complete the co-operative course at the University of Waterloo if he is not capable of regular progress in his work assignments. The Co-ordination Department is in close liaison with the Faculty, with industry, and with students both on and off the campus, so that a fair assessment of a student's progress can be made by a member of the department. This knowledge is especially valuable as an aid in the counselling of students.

During the student's periods in industry, he carries a responsibility to build and maintain his own good reputation as well as that of the University. Poor performance, such as unexcused absence from work, consistent lack of punctuality, inability to work with supervisors or fellow workers, or a serious lack of interest in the job, will be interpreted as an indication that the student is not acceptable for professional training. A student who fails to honour an agreement to work with a company or who leaves his co-operative employment without prior approval from the Co-ordination Department, or who conducts himself while on the job so as to purposely cause his discharge, may be suspended immediately from the University for breach of discipline.

From the foregoing, it may be seen that the Co-ordination Department provides the student with assistance and counselling necessary to ensure proper integration of the academic and industrial phases of his education.
ACADEMIC PROGRAMMES

It is important to summarize the principles and objectives of the engineering curricula at Waterloo, as they relate to 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 course, 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 course provides the same Mathematics, Physics, and Science courses as found in the first-year course in the Faculty of Science.

The core programmes for each of the four 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. Engineering Physics programmes, in which studies in engineering are associated with advanced study in Mathematics and Pure Science are thus available, in effect, in every major field, and supplant previous separate courses in Engineering Physics.

It will be noted that, while the work of the first year is indicated in detail, the distribution of other courses between the various terms of the remainder of the course are not indicated precisely, since it is desired to maintain flexibility in order that special programmes can be developed. Individual classes in course will be advised of ordinary course schedules. In most programmes, about sixteen hours a week are spent in lectures, and about ten hours a week are spent in laboratory.

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 must be 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 four basic curricula areas reflects primary 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 one of the four 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 governmental agency, in research, education, design, design development, or administrative work.
**PRE-ENGINEERING YEAR**

*(For Admission Requirements see page 49)*

<table>
<thead>
<tr>
<th></th>
<th>First Term Lect.</th>
<th>Lab. or Prob.</th>
<th>Second Term Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 2</td>
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<td>2</td>
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<td>Math 6</td>
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<td>Math 7</td>
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<td>Math 8</td>
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<td>4</td>
</tr>
<tr>
<td>Phys 5</td>
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<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Chem 5</td>
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<td>4</td>
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<tr>
<td>Arts</td>
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<td>-</td>
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<tr>
<td>Arts</td>
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<td>Arts Non-Technical Elective</td>
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**YEAR I**

*(For Admission Requirements, see page 50)*

<table>
<thead>
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<th></th>
<th>First Term Lect.</th>
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<td>3</td>
</tr>
<tr>
<td>Chem 11</td>
<td>3</td>
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<tr>
<td>Philosophy 15</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

**NOTE:** *signifies a course given on alternate weeks.

Detailed course descriptions commence on page 107.

All courses are of single term duration unless specifically indicated.

At the completion of the First Year, students are required to select one of the four major divisions of engineering:

- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering

Since the Faculty of Engineering is primarily oriented towards a modern scientific approach to engineering, students interested in

**Engineering Physics**

can register in any one of the four major engineering programmes and pursue a suitable course of study, including elective advanced courses in Mathematics, Chemistry and Physics. Alternatively, students primarily interested in Physics should consider major study directly in that field, as offered in the Faculty of Science.
CHEMICAL ENGINEERING

The course offered by the Department of Chemical Engineering is intended to prepare students for professional careers in those fields of engineering where physical-chemical transformations of matter play a significant role. The academic curriculum is based on the concept that undergraduate studies, to be most effective in a scientific industrial age, must deal primarily with basic scientific and engineering principles. In the earlier years the subject matter is analytical and closely prescribed—mathematics, physics, and chemistry form the foundation. In the senior years, subjects such as transport processes, process system design, and economic analysis, enable the student to reach a more comprehensive understanding of his previous work. A certain degree of specialization is available in the final year through options oriented towards Chemistry, Chemical Engineering, Applied Mathematics, and Industrial Management. The co-operative work assignments form an introduction to the different aspects of engineering such as research, development, design, production, economic factors, etc., and provide for relating theory and practice in education. Work programmes are carefully planned and developed to enable the student to obtain maximum experience in industry.

A CORE PROGRAMME

a. Mathematics and Science Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 22</td>
<td>Calculus II</td>
<td>3</td>
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</tr>
<tr>
<td>Math 23</td>
<td>Numerical Methods</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Math 31</td>
<td>Differential Equations</td>
<td>3</td>
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</tr>
<tr>
<td>Math 32</td>
<td>Numerical Analysis</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Math 41</td>
<td>Applied Analysis I</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Math 51</td>
<td>Probability and Statistics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Phys 12</td>
<td>Electricity and Magnetism I</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Phys 13</td>
<td>Electricity and Magnetism II</td>
<td>2</td>
<td>3*</td>
</tr>
<tr>
<td>Chem 22</td>
<td>Analytical Chemistry</td>
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<td>3</td>
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<tr>
<td>Chem 26</td>
<td>Organic Chemistry I</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Chem 31</td>
<td>Atomic and Molecular Structure</td>
<td>3</td>
<td>-</td>
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<tr>
<td>Chem 35</td>
<td>Electrochemistry</td>
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<td>3*</td>
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<tr>
<td>Chem 36</td>
<td>Organic Chemistry II</td>
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</table>
b. Engineering Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>CE 21</td>
<td>Mechanical of Deformable Solids I</td>
<td>3</td>
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<tr>
<td>ChE 11</td>
<td>Chemical Process Principles I</td>
<td>3</td>
</tr>
<tr>
<td>ChE 12</td>
<td>Chemical Process Principles II</td>
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</tr>
<tr>
<td>ChE 13</td>
<td>Unit Operation Analysis</td>
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</tr>
<tr>
<td>ChE 21</td>
<td>Transport Processes I</td>
<td>3</td>
</tr>
<tr>
<td>ChE 22</td>
<td>Transport Processes II</td>
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<td>ChE 31</td>
<td>Physical-Chemical Principles</td>
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<td>ChE 32</td>
<td>Chemical Process Principles II</td>
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<tr>
<td>ChE 33</td>
<td>Thermodynamics I</td>
<td>3</td>
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<td>ChE 41</td>
<td>Reaction Kinetics I</td>
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</tr>
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<td>ChE 42</td>
<td>Reaction Kinetics II</td>
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<td>ChE 51</td>
<td>Process System Theory I</td>
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<td>ChE 52</td>
<td>Process System Theory II</td>
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<td>ChE 61</td>
<td>Industrial Economics</td>
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<td>Process System Design</td>
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<td>ChE 71</td>
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<td>Chemical Engineering Lab. II</td>
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<tr>
<td>ChE 91</td>
<td>Seminar</td>
<td>1</td>
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</tbody>
</table>

c. Non-Technical Courses

Two Social Science Electives chosen from:

- Economics: 3 credits
- Geography: 3 credits
- Political Science: 3 credits
- Psychology: 3 credits
- Sociology: 3 credits

B. ELECTIVE COURSES

A minimum of 28 hours (lectures and laboratories) may be chosen in several options, and emphasis may be placed on courses in Chemical Engineering, Chemistry, or Applied Mathematics. The programme will be selected in consultation with the Chemical Engineering Department. Elective courses may be chosen from the following list, from other Engineering course lists, or from Arts and Science course lists.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChE 23</td>
<td>Transport Processes III</td>
<td>3</td>
</tr>
<tr>
<td>ChE 34</td>
<td>Thermodynamics III</td>
<td>3</td>
</tr>
<tr>
<td>ChE 43</td>
<td>Reaction Kinetics III</td>
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</tr>
<tr>
<td>ChE 53</td>
<td>Process Dynamics and Control</td>
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<tr>
<td>ChE 73</td>
<td>Chemical Engineering Lab. III</td>
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</tr>
<tr>
<td>ChE 98</td>
<td>Research and Design Project I</td>
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<tr>
<td>ChE 99</td>
<td>Research and Design Project II</td>
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<td>Math 42</td>
<td>Vector Methods</td>
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<tr>
<td>Math 44</td>
<td>Complex Variable</td>
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<tr>
<td>Math 45</td>
<td>Applied Analysis II</td>
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</tr>
<tr>
<td>Math 55</td>
<td>Digital Computer Programming</td>
<td>3</td>
</tr>
<tr>
<td>Math 56</td>
<td>Matrix Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Chem 21</td>
<td>Inorganic Chemistry</td>
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</tr>
<tr>
<td>Chem 37</td>
<td>Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>Chem 41</td>
<td>Nuclear and Radio Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Chem 45</td>
<td>Surface Phenomena</td>
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<tr>
<td>Chem 46</td>
<td>Organic Chemistry III</td>
<td>3</td>
</tr>
<tr>
<td>Chem 55</td>
<td>Polymer Physics and Chemistry</td>
<td>3</td>
</tr>
</tbody>
</table>
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 in fulfilling these demands, spend well over a tenth of our total national income—more money than 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 the principles of Engineering, students are also introduced to other engineering subjects such as thermodynamics and electricity, as a preparation for Civil Engineering studies. Whereas complete professional specialization can be achieved only in postgraduate study and in engineering practice, the students can find ample 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) **Municipal and 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, city planning and design of municipal facilities.

(c) **Highway Engineering**—is intended for the student interested in the planning, design, construction and traffic operation of streets and highways. Emphasis is placed on planning and design related to traffic demands.

(d) **Foundation Engineering and Soil Mechanics**—is designed to provide the students 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 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, or mechanics of solids and fluids.

**A CORE PROGRAMME**

<table>
<thead>
<tr>
<th>Courses</th>
<th>Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 22 Calculus II</td>
<td>3</td>
<td>-</td>
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<tr>
<td>Math 23 Numerical Methods</td>
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<tr>
<td>Math 31 Differential Equations</td>
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<tr>
<td>Math 32 Numerical Analysis</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Math 51 Probability and Statistics</td>
<td>2</td>
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</tr>
<tr>
<td>Phys 12 Electricity and Magnetism I</td>
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</tr>
<tr>
<td>Phys 13 Electricity and Magnetism II</td>
<td>2</td>
<td>3*</td>
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62
### b. Engineering Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 21</td>
<td>Mechanics of Deformable Solids I</td>
<td>3</td>
</tr>
<tr>
<td>CE 22</td>
<td>Mechanics of Deformable Solids II</td>
<td>2</td>
</tr>
<tr>
<td>CE 31</td>
<td>Theory of Structures I</td>
<td>2</td>
</tr>
<tr>
<td>CE 32</td>
<td>Theory of Structures II</td>
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<tr>
<td>CE 33</td>
<td>Behaviour and Design of Metallic Structures</td>
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</tr>
<tr>
<td>CE 34</td>
<td>Behaviour of Plain and Reinforced Concrete</td>
<td>3</td>
</tr>
<tr>
<td>CE 35</td>
<td>Structural Design</td>
<td>2</td>
</tr>
<tr>
<td>CE 41</td>
<td>Surveying</td>
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</tr>
<tr>
<td>CE 51</td>
<td>Geology for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>CE 52</td>
<td>Soil Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CE 53</td>
<td>Foundations and Earth Structures</td>
<td>3</td>
</tr>
<tr>
<td>CE 61</td>
<td>Highway Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>CE 71</td>
<td>Water Resources Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CE 81</td>
<td>Law, Contracts and Specifications</td>
<td>2</td>
</tr>
<tr>
<td>CE 82</td>
<td>Urban Planning</td>
<td>3</td>
</tr>
<tr>
<td>CE 83</td>
<td>Project Management</td>
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<tr>
<td>CE 84</td>
<td>Civil Engineering Design Studies I</td>
<td>6</td>
</tr>
<tr>
<td>EE 31</td>
<td>Electra-Mechanical Systems</td>
<td>3</td>
</tr>
<tr>
<td>ME 11</td>
<td>Dynamics</td>
<td>2</td>
</tr>
<tr>
<td>ME 31</td>
<td>Properties of Materials</td>
<td>2</td>
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<tr>
<td>ME 51</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 61</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>

### c. Non-Technical Courses

Two Social Science Electives chosen from:

- Economics                                      | 3 |
- Geography                                      | 3 |
- Political Science                               | 3 |
- Psychology                                     | 3 |
- Sociology                                      | 3 |

### B. ELECTIVE COURSES

Six elective courses are required in addition to the core courses listed above to fulfill the requirements of the Civil Engineering programme. Considerable latitude for individual choice is available depending upon the particular Civil Engineering option selected. Elective courses may be chosen from the list below or from other Engineering course lists, or from Arts or Science course lists. Programmes will include:

- One of:
  - CE 85 Civil Engineering Design Studies II     | 9 |
  - CE 86 Research Project                        | 9 |

And five subjects to make an integrated programme, chosen from the list below, or other lists as appropriate:

- CE 42 Surveying and Photogrammetry             | 3 |
- CE 62 Highway Engineering II                   | 3 |
- CE 72 Environmental Health Engineering         | 3 |
- CE 609 Theory of Structures III                | 3 |
- CE 614 Mechanics of Media                      | 3 |
- CE 654 Advanced Soil Mechanics                 | 3 |
- Math 41 Applied Analysis I                      | 2 |
- Math 42 Vector Methods                          | 2 |
- Math 44 Complex Variable                       | 2 |
- Math 45 Applied Analysis II                     | 3 |
- Math 55 Digital Computer Programming           | 3 |
- Math 56 Matrix Algebra                          | 3 |
ELECTRICAL ENGINEERING

Electrical Engineering encompasses a wide variety of specialized topics as evidenced by the 29 distinct professional groups in the Institution of Radio Engineers, one of the largest professional organizations in North America. Listed in alphabetical order, the professional groups range from Aeronautical and Navigational Electronics to Vehicular Communications, which still does not include the different areas of power engineering. Such areas as Electronic Computers and Automatic Control Systems, which have helped considerably for the advent of the Space Age, come within the purview of Electrical Engineering.

It has become clearly impossible for any EE curriculum to address itself to narrow specializations centered around technologies, for there are too many of them.

Consistent with modern trends in Electrical Engineering education, Waterloo has endeavoured to stress some of the basic disciplines underlying the various branches of Electrical Engineering. Some such disciplines are:

(a) System Theory;
(b) Field Theory;
(c) Communication Theory;
(d) Analogue and Digital Computation.

The courses on Electro-Mechanics, Network Theory, Electronic Circuits, Control Systems, etc., come under group (a). Transmission Lines, Micro-Wave Circuits, aspects of design, etc., come under group (b); Group (c) includes those areas for which a knowledge of probability and statistics is essential. Group (d), although a discipline in its own entity, is interspersed throughout the other areas.

A CORE PROGRAMME

<table>
<thead>
<tr>
<th>a. Mathematics and Science Courses:</th>
<th>Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 22 Calculus II</td>
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<tr>
<td>Math 23 Numerical Methods</td>
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<td>2</td>
</tr>
<tr>
<td>Math 24 Mathematics Problems</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>Math 31 Differential Equations</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>Math 32 Numerical Analysis</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Math 33 Differential Calculus</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>Math 34 Integral Calculus</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>Math 44 Complex Variables</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Phys 12 Electricity &amp; Magnetism I</td>
<td>2</td>
<td>3*</td>
</tr>
<tr>
<td>Phys 13 Electricity &amp; Magnetism II</td>
<td>2</td>
<td>3*</td>
</tr>
<tr>
<td>Phys 15 Modern Physics</td>
<td>3</td>
<td>–</td>
</tr>
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</table>
b. Engineering Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 41</td>
<td>Network Theory I</td>
<td>4</td>
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<td>EE 42</td>
<td>Network Theory II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 51</td>
<td>Electronics I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 52</td>
<td>Electronics II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EE 61</td>
<td>Electromechanics I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 62</td>
<td>Electromechanics II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 71</td>
<td>Electromagnetic Fields I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 72</td>
<td>Electromagnetic Fields II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 81</td>
<td>Control Systems I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 82</td>
<td>Control Systems II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 91</td>
<td>Electrical Laboratory I</td>
<td>-</td>
<td>3*</td>
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<tr>
<td>EE 92</td>
<td>Electrical Laboratory II</td>
<td>-</td>
<td>6</td>
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<tr>
<td>EE 93</td>
<td>Electrical Laboratory III</td>
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<td>EE 94</td>
<td>Electrical Laboratory IV</td>
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<tr>
<td>EE 95</td>
<td>Electrical Laboratory V</td>
<td>-</td>
<td>4½</td>
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<tr>
<td>EE 96</td>
<td>Electrical Laboratory VI</td>
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<tr>
<td>EE 99</td>
<td>Seminar</td>
<td>-</td>
<td>2</td>
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<tr>
<td>CE 21</td>
<td>Mechanics of Deformable Solids</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>ME 11</td>
<td>Dynamics</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>ME 31</td>
<td>Properties of Materials</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ME 51</td>
<td>Thermodynamics</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

B. ELECTIVE COURSES

Nine elective courses are required in addition to the core engineering courses listed above to fulfill the requirements of the Electrical Engineering programme. Considerable latitude for individual choice is available to enable specialization in particular Electrical Engineering fields. Elective courses may be chosen from the list below, or from other Engineering, Arts, or Science course lists at comparable level, with the approval of the Department Chairman.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 23</td>
<td>Analogue Computation</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 24</td>
<td>Logic &amp; Switching</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 44</td>
<td>Pulse &amp; Switching Circuits</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 45</td>
<td>Network Synthesis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 55</td>
<td>Solid State Electronics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 64</td>
<td>Advanced Electromechanics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 65</td>
<td>Power Systems Analysis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 74</td>
<td>Microwave Circuit Theory</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE 75</td>
<td>Electric &amp; Magnetic Materials</td>
<td>3</td>
<td></td>
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<tr>
<td>EE 83</td>
<td>Communication Theory</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Math 51</td>
<td>Probability &amp; Statistics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Math 55</td>
<td>Digital Computer Programming</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Math 56</td>
<td>Matrix Algebra</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

* The EE Department recommends that a student elect Math 56, Math 51 and Math 55 irrespective of the area of specialization in particular engineering fields.
Traditionally, Mechanical Engineers have been engaged in all phases of Canadian industry ranging from power generation, transmission and utilization to the design and manufacture of a wide variety of machines and equipment. 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 basic fundamentals in the mathematical, physical, chemical, and engineering sciences.

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 the other branches of engineering. The second year provides elementary courses in Mechanical Engineering and certain branches of Civil and 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) **Thermo-Fluid Mechanics Option**—is to accommodate students chiefly interested in the inter-related fields of thermodynamics and fluid flow including aerodynamics and gas dynamics. Emphasis is placed on the mathematical and physical aspects of the subject in order to develop a sound engineering-scientific perspective and capability.

(b) **Engineering Mechanics Option**—is intended primarily for those interested in research and development careers in engineering. The courses are oriented for the student to obtain depth of understanding in the basic sciences (mathematics, physics, and chemistry) and the engineering sciences (particularly with respect to the mechanics of solids) and to gain insight and skill in the application of these sciences to engineering problems.

(c) **Mechanical and Structural Design Option**—is intended for the student with a strong interest in design. The overall system approach to design is followed. Since mechanical design often extends into the field of structures, particularly when the unit being designed is large, structural engineering courses are suggested. Similarly of value are courses in heat transfer and fluid flow.

(d) **Industrial Engineering Option**—is designed to provide the student, with an understanding of industry from the viewpoint of its organization, its processes, and the application of mathematics to its operations. It is suggested for those students primarily interested in the industrial planning aspects of mechanical engineering.

(e) **Engineering Materials Science**—is for students who are interested in broadening their knowledge and qualifications into such fields as Metallurgy, Plastics or Ceramics. The course work will provide a fundamental understanding of the structure and behaviour of materials as used in industrial applications.

**A CORE PROGRAMME**

<table>
<thead>
<tr>
<th>a. Mathematics and Science Courses</th>
<th>Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 22 Calculus II</td>
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<tr>
<td>Math 23 Numerical Methods</td>
<td>3</td>
<td>2</td>
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<td>Math 31 Differential Equations</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Math 32 Numerical Analysis</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Math 41 Applied Analysis</td>
<td>2</td>
<td>-</td>
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<tr>
<td>Phys 12 Electricity and Magnetism I</td>
<td>2</td>
<td>3*</td>
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<tr>
<td>Phys 13 Electricity and Magnetism II</td>
<td>3</td>
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<tr>
<td>Phys 15 Modern Physics</td>
<td>3</td>
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</table>
b. Engineering Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 12</td>
<td>Dynamics</td>
<td>3</td>
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<tr>
<td>ME 13</td>
<td>Kinematics</td>
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<tr>
<td>ME 21</td>
<td>Mechanics of Machinery</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ME 22</td>
<td>Design of Machines</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>ME 32</td>
<td>Properties of Materials I</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ME 33</td>
<td>Properties of Materials II</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ME 52</td>
<td>Thermodynamics I</td>
<td>3</td>
<td>3</td>
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<tr>
<td>ME 53</td>
<td>Heat Transfer</td>
<td>3</td>
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<td>ME 61</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<tr>
<td>ME 71</td>
<td>Fundamentals of Design</td>
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<tr>
<td>ME 81</td>
<td>Seminar</td>
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<tr>
<td>ME 82</td>
<td>Mechanical Engineering Projects</td>
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<tr>
<td>CE 21</td>
<td>Mechanics of Deformable Solids I</td>
<td>3</td>
<td>2</td>
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<tr>
<td>CE 22</td>
<td>Mechanics of Deformable Solids II</td>
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<td>EE 31</td>
<td>Electro-Mechanical Systems</td>
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<td>EE 32</td>
<td>Electronics</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EE 81</td>
<td>Control Systems</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

c. Non-Technical Elective Courses

Two Social Science electives chosen from the following:

- Economics: 3
- Geography: 3
- Political Science: 3
- Psychology: 3
- Sociology: 3

B. ELECTIVE COURSES

Twelve elective courses are required in addition to the core courses listed above to fulfill the requirements of the Mechanical Engineering programme. Considerable latitude for individual choice is available depending upon the particular Mechanical Engineering option selected. Elective courses may be chosen from the list below or from other Engineering course lists, or from Mathematics, Arts, and Science, lists.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lect.</th>
<th>Lab. or Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 23</td>
<td>Analysis and Synthesis of Machines</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>ME 25</td>
<td>Mechanical Vibrations</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>ME 34</td>
<td>Solid State for Engineers</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>ME 35</td>
<td>Nuclear Engineering</td>
<td>3</td>
<td>-</td>
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<tr>
<td>ME 36</td>
<td>Physical Metallurgy</td>
<td>3</td>
<td>-</td>
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<tr>
<td>ME 37</td>
<td>Ceramics</td>
<td>3</td>
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<td>ME 41</td>
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<td>ME 42</td>
<td>Industrial Organization</td>
<td>3</td>
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<td>ME 54</td>
<td>Thermodynamics II</td>
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<td>ME 55</td>
<td>Statistical Thermodynamics</td>
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<td>ME 56</td>
<td>Heat, Mass and Momentum Transfer</td>
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<td>ME 62</td>
<td>Fluid Dynamics</td>
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<td>ME 63</td>
<td>Fluid Machinery and Incompressible Flow</td>
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<td>ME 64</td>
<td>Hydraulic Engineering</td>
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<td>ME 65</td>
<td>Gasdynamics</td>
<td>3</td>
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<td>ME 72</td>
<td>Professional Creativity</td>
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<td>Mechanics of Media</td>
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<td>Digital Computer Programming</td>
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<tr>
<td>Chem 25</td>
<td>Polymer Chemistry and Physics</td>
<td>3</td>
<td>-</td>
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</tbody>
</table>
DEPARTMENT OF
CO-ORDINATION AND PLACEMENT

Director
A. S. Barber, P.Eng.

Senior Co-ordinator
M. S. Stevens, B.Sc. (Queen's), P.Eng.

Co-ordinators
D. G. S. Anderson, B.A.Sc. (Toronto), P.Eng.
H. D. Ball, B.A. (Western), P.Eng.
R. G. McKelvey, B.Sc. (Queen's), P.Eng.
A. M. Moon, B.A.Sc. (Toronto), P.Eng.
R. D. Mumford, B.Sc. (Queen's), P.Eng.
M. M. Smith, B.Sc. (Queen's), P.Eng.
The Industrial Advisory Council is composed of delegates from companies interested in engineering education. The Council acts in an advisory capacity, presenting industry's viewpoint to the University on the programming of the co-operative course at Waterloo as it affects the relations of the University and its students with industry.

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The Anthes-Imperial Company Limited
Atlas Steels Limited
Babcock-Wilcox & Goldie-McCulloch Limited
The Bell Telephone Company of Canada
Canadian General Electric Company Limited
Canadian Pacific Railway Company
Canadian Westinghouse Company Limited
Cynamid of Canada Limited
Dominion Foundries and Steel Limited
Dominion Tar & Chemical Company Limited
Dominion Rubber Company Limited
Dominion Textile Company Limited
The Foundation Company of Canada Limited
Honeywell Controls Limited
Hydro-Electric Power Commission of Ontario
John Inglis Co. Limited
The International Nickel Company of Canada Ltd.
International Harvester Company of Canada, Ltd.
Joy Manufacturing Company (Canada) Limited
Link-Belt Limited
Minnesota Mining & Manufacturing of Canada Ltd.
Noranda Mines, Limited
Polymer Corporation Limited
Rio Tinto Canadian Exploration Ltd.
Thompson Products Limited
Trans-Canada Pipe Lines Limited
Union Carbide Canada Limited
Wallaceburg Brass Limited

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Mr. H. T. Airey
Mr. E. P. Lewis
Dr. E. L. Evans
Mr. A. C. Kennedy
Mr. P. M. Allen
Mr. G. O. Loach
Mr. J. A. Burgess
LIST OF CO-OPERATIVE COMPANIES

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Allen-Bradley Canada Limited
Aluminum Company of Canada, Limited
Andrew Antenna Corporation Limited
Anglin-Norcross Ontario Limited
The Anthes-Imperial Company Limited
The Arborite Company Limited
Archibald, Gray & McKay, O.L.S.
W. S. Atkins & Associates Ltd.
Atlas Steels Limited
Atomic Energy of Canada Limited
Aunor Gold Mines Limited

Babcock-Wilcox & Goldie-McCulloch Limited
Barringer Research Limited
Bathurst Containers Limited
Beaver Construction Company
Beckett Elevators Limited
The Bell Telephone Company of Canada
The Best Foods (Canadian) Ltd.
Black & McDonald Limited
Black-Clawson-Kennedy Ltd.
Blacktop Paving Co. Ltd.
Boeing (Canada) Limited - Vertol Division
Brantford, City of - Engineering Department
Brantford Coach and Body Limited
Brockville Chemicals Limited
Building Products Limited

Cabot Carbon of Canada Limited
Calvert Distillers Limited
Campbell Soup Company Limited
Canada and Dominion Sugar Company Limited
Canada Machinery Corporation, Limited
Canada Sand Papers Limited
Canada Vitrified Products Limited
Canadian Admiral Corporation Limited
Canadian Allis-Chalmers Limited
Canadian Aviation Electronics Limited
The Canadian Blower & Forge Company Limited
Canadian Brass Limited
The Canadian Coleman Company Limited
Canadian Copper Refiners Limited
Canadian Engineering & Contracting Company Limited
Canadian General Electric Company Limited
Canadian General-Tower Limited
Canadian Industries Limited
Canadian International Paper Company
Canadian Johns-Manville Co., Limited
Canadian Kodak Company Limited
Canadian Motorola Electronics Company
Canadian National Railways
Canadian National Telecommunications
Canadian Refractories Limited
Canadian Research Institute
Canadian Thermos Products Limited
Canadian Underwriters' Association
Canadian Westinghouse Company Limited
The Capital Wire Cloth & Mfg. Co. Limited
Chatham, City of - Engineering Department
Chicago Rawhide Products Canada Limited
Clare Brothers Limited
Collins Radio Company of Canada Limited
Columbian Carbon (Canada) Limited
Combustion-Engineering Superheater Limited
Consolidated Sand and Gravel Limited
The Consumers' Gas Company
Consumers' Glass Company Limited
Cooper-Bessemer of Canada Limited
Corning Glass Works of Canada Ltd.
Crane Company Canada Ltd.
Crysler, Davis & Jorgensen, Limited
C T S of Canada Limited
Cyanamid of Canada Limited

Dahmer Sheet Metals Limited
Dawson, R. M. - Consultant
John Deere Welland Works
The DeHavilland Aircraft of Canada, Limited
De Laval Company Limited
De Leuw, Cather and Co. of Canada, Ltd.
Department of Highways, Ontario
Department of Mines, Ontario
Department of Transport - Air Services Civil Aviation Division
Direct Winters Transport Limited
Dominion Bridge Company Limited
Dominion Electrohome Industries Limited
Dominion Foundries and Steel Limited
Dominion Magnesium Limited
The Dominion Road Machinery Co. Ltd.
Dominion Rubber Company Limited
Dominion Structural Steel Division - Canada Iron Foundries
Dominion Textile Company Limited
Domtar Chemicals Ltd.
Domtar Construction Materials Ltd.
Domtar Pulp and Paper Limited
Dravo of Canada Limited
Drew Chemical Ltd.
Dunker Construction Limited
Dunlop Canada Limited
Du Pont of Canada Limited

The E. B. Eddy Company
Eldorado Mining and Manufacturing Limited
The Electric Storage Battery Company (Canada) Ltd.
Electrical Bureau of Canada
Ellis-Don Ltd.
Emco Limited
Emery Industries (Canada) Limited
English Electric Canada
The Exolon Company

Federal Pacific Electric of Canada
Ferranti-Packard Electric Limited
Fiberglas Canada Limited
Fine Chemicals of Canada Limited
Fischer & Porter (Canada) Limited
Ford Motor Company of Canada Limited
The Foundation Company of Canada Limited
Franklin Mfg. Co. (Canada) Ltd.
The Frontier College

John Gaffney Construction Co. Limited
Galt Metal Industries Limited
Geco Mines Limited
General Concrete Ltd.
General Motors of Canada, Limited
Giffels & Vallet of Canada Limited
The General Tire & Rubber Co. of Canada Limited
Gilvesy Construction Limited
H. Q. Golder and Associates Limited
B. F. Goodrich Canada Limited
The Goodyear Tire & Rubber Company of Canada Limited
W. R. Grace & Co. of Canada Ltd.
Great Lakes Power Company, Limited
The Greening Wire and Perforated Metal Company
Guelph Stove Company Limited
Guild Electric Limited

Hallnor Mines, Limited
Hamilton, City of - Engineering Department
FACULTY OF ENGINEERING

Hammond Manufacturing Company, Limited
Hayes Steel Products Limited
Howard B. Head, O.L.S.
John T. Hepburn, Limited
The Hobart Manufacturing Company Limited
Honeywell Controls Limited
Horton Steel Works Limited
The Hydro-Electric Power Commission of Ontario

John Inglis Co. Limited
International Business Machines Company Limited
International Harvester Company of Canada Limited
Interprovincial Pipe Line Company
Iron Ore Company of Canada

Kaufman Rubber (Ontario) Limited
Kawartha Broadcasting Co.
Kerr-Addison Gold Mines Limited
Kimberly-Clark Pulp and Paper Company Limited
Kitchener, City of - Engineering Department
Kitchener Public Utilities Commission
Koehring-Waterous Limited
Konvey Construction Company Limited
The K V P Company Limited

John Labatt Limited
Lackie Brothers Limited
Lever Brothers Limited
Link-Belt Limited
Litton Systems (Canada) Limited
London, City of - Engineering Department

Marsland Engineering Limited
Massey-Ferguson Limited
Matthews Construction Company Limited
Measurement Engineering Company Limited
Minnesota Mining and Manufacturing of Canada Limited
Moffats Limited
Molson's Brewery (Ontario) Limited
Montreal Engineering Company Limited
Municipality of Metropolitan Toronto
McCargar, Filer and Hachborn Limited
McCormick & Rankin Limited
McIntyre Porcupine Mines Limited
MacLeod-Cockshutt Gold Mines Limited

National Sewer Pipe Limited
National Silicates, Limited
Naugatuck Chemicals - Div. of Dominion Rubber Company Limited
R. H. Nichols Limited
Noranda Mines, Limited
Noranda Research Centre
Northern Electric Company Limited
North York Township - Planning Board

The Ontario Paper Company Limited
Otis Elevator Company Limited
C. C. Parker & Associates Limited, Consulting Engineers
John B. Parkin Associates
Peterborough, City of - Engineering Department
E. M. Peto and Associates Limited
E. W. Petzold, Consulting Engineers
Pigott Construction Company Limited
Pioneer Saws Limited
Polycoating & Film Company Limited
Polymer Corporation Limited
Potter & Brumfield Canada Limited
Preston, Town of - Engineering Department
Price Brothers & Company Limited
The Procter and Gamble Company of Canada, Limited
Provincial Gas Company Limited
Purolator Products (Canada) Limited
Quaker Oats Company of Canada Limited
Quebec Cartier Mining Company
Quemont Mining Corporation, Limited
RCA Victor Company Limited
Raytheon Canada Limited
Red-D-Mix Concrete Limited
Retor Developments Limited
J. Ritchie Limited
Robertson-Irwin Limited
Roelofson Elevator Company Limited
Ross of Canada - Division of Midland-Ross of Canada
St. Lawrence Cement Co.
St. Lawrence Corporation Limited
Sarnia Scaffolds Limited
J. M. Schneider Limited
Schultz Construction Limited
Joseph E. Seagram & Sons Limited
Shawinigan Chemicals Limited
Sheafer-Townsend Ltd.
Shell Oil Company of Canada, Limited
Sherbrooke Machineries, Limited
Shore and Moffat, Architects
Sinclair Radio Laboratories, Limited
Howard Smith Paper Mills Limited
A. G. Spalding & Bros. of Canada Limited
Standard Prestressed Structures Limited
The Steel Company of Canada Limited
Stephens-Adamson Mfg. Co. of Canada Limited
Stratford Public Utility Commission
Sudbury, City of - Engineering Department
Sun Oil Company Limited
Sunshine Office Equipment Limited
Faculty of Engineering

Tamper - Division of Canada Iron Foundries Limited
Texaco Canada Limited
Thompson Products Limited
The Torrington Manufacturing Co. of Canada Limited
Toronto Transit Commission
Trans-Canada Pipe Lines Limited
Turnbull Elevator Company Limited
United Aircraft of Canada Limited
United Steel Corporation Limited
Union Carbide Canada Limited
Union Gas Company Limited
Douglas G. Ure and Sons, Land Surveyors

Varian Associates of Canada Limited

Wagner Leland - Division of Sangamo Company Limited
Wallaceburg Brass Limited
Warnock Hersey Company Ltd.
Waterloo County Engineer
Waterloo, City of - Engineering Department
University of Waterloo
Webb & Knapp Communities Limited
Welland County Engineer
White-Mossop & Associates Ltd.
Wilcolator (Canada) Limited
W. C. Wood Company Limited
Wunder Machine Co. Ltd.

York Gears Limited
IV

THE FACULTY
OF SCIENCE
THE FACULTY OF SCIENCE

The rapid and successful growth of the University's Engineering Faculty brought together a considerable number of scientists and mathematicians to provide the basic instruction for Engineering students. Before long, it became possible to offer a programme in Science, and the University issued its first calendar for the Faculty of Science in the Spring of 1959. The programmes of the Faculty were organized under its first Dean, the late B. W. Kelley.

There are three teaching departments within the Faculty of Science: Physics, Chemistry and Biology. Extensive instruction is also given by members of the University's Mathematics Department. Instruction in Astronomy and in Geology is given by members of the Physics Department, Biochemistry is offered by the Chemistry Department; Botany, Zoology, and certain courses embracing these fields together, are taught in the Biology Department. All three departments offer post-graduate instruction for details of which see the section of the calendar dealing with Graduate studies. The majority of the graduates in Honours courses in Science undertake some postgraduate study.

All courses in this Faculty except Applied Physics are offered in two terms throughout a conventional academic year. The Applied Physics course is given on a co-operative basis with alternating terms of academic and industrial work in the same manner as the courses in the Faculty of Engineering (see chart on page 48).

The Dean and departmental chairmen in this Faculty invite inquiries from or interviews with students contemplating a University course in fields leading to the B.Sc. degree.
DEGREES

The Degree of Bachelor of Science (B.Sc.) is awarded by the University in the following undergraduate courses:

GENERAL COURSE (3 YEARS)
GENERAL SCIENCE

HONOURS COURSES (4 YEARS)
CHEMISTRY
CHEMISTRY AND BIOLOGY
CHEMISTRY AND PHYSICS
MATHEMATICS AND PHYSICS
CO-OPERATIVE APPLIED PHYSICS

Graduation from the three-year course in General Science has been approved by the Department of Education as acceptable academic preparation admitting to the course leading to the High School Assistant's Certificate, Type "B", at the Ontario College of Education.

Graduation with Honours from the four-year course in Chemistry or in Chemistry and Physics has been approved by the Department of Education of Ontario as acceptable academic preparation admitting to the course leading to the High School Assistant's Certificate, Type "A", in Physics and Chemistry at the Ontario College of Education.

Graduation with Honours from one of the four-year courses in Mathematics, Physics, and Applied Physics has been approved by the Department of Education of Ontario as acceptable academic preparation admitting to the course leading to the High School Assistant's Certificate, Type "A", in Mathematics and Physics at the Ontario College of Education.
ADMISSION AND REGISTRATION

General

Application for admission to the Faculty of Science should be made as early in the year as possible, on forms provided by the Office of the Registrar. Academic certificates (not diplomas) and other supporting documents should be forwarded as soon as they become available. Admission to the faculty cannot be granted until all requirements have been met and all documents submitted.

Admission to Year I

In order to qualify for admission to Year I of the Science course, the applicant must have completed the requirements for the Ontario Secondary School Honour Graduate Diploma (Senior Matriculation), or its equivalent, showing an over-all average of 60% in nine Grade XIII papers, with a minimum of 60% in the five papers required in Mathematics and Science. Standing is required in the following subjects:

- English (Composition and Literature)
- Mathematics (Algebra, Geometry, Trigonometry)
- Science (Chemistry, Physics)
- Two additional papers.

Students intending to take an Honours course in Mathematics and Physics or Chemistry and Physics should have a minimum of 66% in the five papers required in Mathematics and Science.

Additional papers can be selected from any of the optional subjects offered at the Grade XIII level with the qualification that no more than one of the following papers may be counted as an “additional” paper: Accountancy Practice, Secretarial Practice, Mathematics of Investment, and Music (Departmental Examination). The marks received in one of these papers will be included in the computation of the applicant’s average. Standing with the Royal Conservatory of Music in Grade VIII practical and Grade II theory will be considered one ‘additional paper’ on the same terms as the above list except the marks received will not be computed in the average.

The following certificates, recognized as being equivalent to the Ontario Grade XIII certificate, may be accepted insofar as they meet the admission requirements of the University of Waterloo in subjects and percentages:

- Alberta
  - Senior Matriculation (Grade XII)
- British Columbia
  - Senior Matriculation (Grade XIII)
- Manitoba
  - Senior Matriculation (Grade XII)
- New Brunswick
  - Senior Matriculation (Grade XII)
- Newfoundland
  - Senior Matriculation (Grade XII)
- Nova Scotia
  - Senior Matriculation (Grade XII)
- Prince Edward Island
  - Third Year Certificate from Prince of Wales College
Quebec McGill Senior Matriculation or Quebec Senior High School Leaving Certificate

Saskatchewan Senior Matriculation (Grade XII)

England and Wales The General Certificate of Education with passes in at least five subjects, two of which must be at Advanced Level. Advanced Level subjects must include Mathematics and either Physics or Chemistry.

Scotland The Scottish Leaving Certificate

United States of America High School graduation plus an additional year of formal study in subjects comparable to Ontario Grade XIII

Admission to Advanced Standing
An applicant for admission to advanced standing must submit an official transcript from the University which he has attended, showing in detail the courses he has taken and his standing in each.

Admission as an Adult Student
Any student of mature age who has been away from formal education for more than two years, and who does not possess the minimum requirements for admission, may apply to enter as an adult student. Each application will be considered on its merits by the Admissions Committee. Under certain circumstances, the applicant may be required to write a qualifying examination.

Admission of Students from Other Countries
Students from areas where English is not the common language must provide certified translations of academic certificates. In addition, the applicant may be required to take either “The English Proficiency Tests” prepared by the English Language Institute of the University of Michigan, or the examinations for “The Certificate of Proficiency in English” of the University of Cambridge, in order to satisfy the Admissions Committee that his knowledge of the English language is adequate to pursue his studies successfully. The expenses involved in administering the test must be borne by the applicant.

Re-Admission
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.

Registration
September 16, Monday, Year I, Science.
September 17, Tuesday, Year II, Science.
September 18, Wednesday, Years III and IV, Science.

Once the student has completed his registration, he may not change his course, add subjects, or drop subjects, without obtaining permission from the Dean, the instructor, and obtaining the necessary course card from the Office of the Registrar.
**FEES**

All fees for the academic session are due and payable on the day of registration. Credit for scholarships or bursaries will be given only on the authority of the Registrar after presentation of proof of the award.

If, for reasons acceptable to the accountant, the fees for the year cannot be paid in full on the day of registration, they may be paid in two instalments, but an extra charge of $5.00 will then be added to the total fee. The first instalment, to be paid on the day of registration, is a minimum of 60% of the tuition fees plus all incidental fees. The balance must be paid in full on the first day of the second term.

A charge of $2.00 per month will be made on overdue accounts. Failure to pay an overdue account before conclusion of lectures will bar a student from writing examinations or obtaining credit for previous work.

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, may entitle him to a refund of a portion of his fees. No fees will be refunded unless this procedure is followed.

Refunds of tuition fees are made at the discretion of the University.

Incidental fees are not refundable.

### Sessional Fees

<table>
<thead>
<tr>
<th></th>
<th>Science Regular Programme</th>
<th>Co-operative Physics-Year I (Per Term)</th>
<th>Co-operative Physics-Other Yrs. (Per Term)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tuition</strong></td>
<td>$435.00</td>
<td>$255.00</td>
<td>$280.00</td>
</tr>
<tr>
<td>Includes registration and regular examination fees</td>
<td>6.50</td>
<td>6.50*</td>
<td>6.50*</td>
</tr>
<tr>
<td><strong>Health Insurance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This plan does not include the premiums or benefits of the Ontario Hospital Services Commission. Ontario Hospital Services coverage is the student's own responsibility. Students participating in any athletics are also responsible for their own coverage under the Ontario Hospital Services Commission.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Student Societies</strong></td>
<td>5.00</td>
<td>2.50</td>
<td>2.50</td>
</tr>
<tr>
<td><strong>Student Publications</strong></td>
<td>9.00</td>
<td>4.50</td>
<td>4.50</td>
</tr>
<tr>
<td><strong>Athletics</strong></td>
<td>14.00</td>
<td>7.00</td>
<td>7.00</td>
</tr>
<tr>
<td><strong>Music</strong></td>
<td>1.00</td>
<td>.50</td>
<td>.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$470.50</td>
<td>$276.00</td>
<td>$301.00</td>
</tr>
</tbody>
</table>

* (8 months)

### Examinations

<table>
<thead>
<tr>
<th></th>
<th>All Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supplemental—Each paper</strong></td>
<td>$10.00</td>
</tr>
<tr>
<td><strong>Special Examination—each paper</strong></td>
<td>15.00</td>
</tr>
<tr>
<td><strong>Presiding fee (at an outside centre, each half day)</strong></td>
<td>5.00</td>
</tr>
</tbody>
</table>

### Part-Time Students

Fee per course (limit, 2 courses per session) 85.00

### Miscellaneous Fees

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Late Registration</strong></td>
<td>10.00</td>
</tr>
<tr>
<td><strong>Transcript of Record</strong></td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Degree and Graduation—Final year only</strong></td>
<td>10.00</td>
</tr>
</tbody>
</table>

The Board of Governors reserves the right to make changes in its published schedule of fees without notice.

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EXAMINATIONS AND PROMOTIONS

The Faculty constitutes the examining body for all University examinations. Final examinations for all years are held in April-May, and cover the whole work of each course. Supplemental examinations are held in August. The time normally allowed for each examination is three hours.

In addition to final examinations, each student in Year I is required to write mid-year tests. These tests are compulsory, and the results obtained are used in determining standing.

The following regulations govern the practice of the Faculty of Science in regard to standings, promotions, and supplemental examinations.

1. All examination results are considered by the Faculty Committee on Standings and Promotions 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.

2. Standing in individual subjects will be granted by letter grade as follows:

<table>
<thead>
<tr>
<th>Range of marks</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 - 100</td>
<td>A</td>
</tr>
<tr>
<td>66 - 74</td>
<td>B</td>
</tr>
<tr>
<td>60 - 65</td>
<td>C</td>
</tr>
<tr>
<td>50 - 59</td>
<td>D</td>
</tr>
<tr>
<td>Below 50, supplemental allowed</td>
<td>S</td>
</tr>
<tr>
<td>Below 50, no supplemental allowed</td>
<td>F</td>
</tr>
</tbody>
</table>

(In this and subsequent sections the term "subject" will apply to individual courses, e.g. Chemistry 131, and the term "course" will apply to groups of subjects, e.g. the Mathematics and Physics Course).

3. Standing in an individual subject is determined by combining the marks assigned for term work with those obtained on written examinations. The ratio in which these marks are combined is at the discretion of the individual departments. To pass in a subject, a candidate must obtain 50% in his examination and a minimum of 50% in the combined term mark and examination mark. A student whose term work is deficient in a subject may, at the discretion of the department concerned and the Dean, be barred from writing the final examination in that subject.

4. Promotion to the next higher year or to graduation will be based on passing the complete year's work, credit will not be granted in individual subjects where a candidate has not passed his year.

5. To pass his year clear in an Honours course, a student must pass in all subjects and obtain an over-all average of 60%.

6. To pass his year clear in the General course, a student must pass in all subjects and obtain an over-all average of 50% and an average of 60% in the subjects of his major field. By this regulation, promotion may be withheld when a student has passed in all subjects but failed to achieve the required standing in his major subjects.
7. An over-all standing in each year will be assigned based on the average of the results of the final examinations in the course. This standing will be a class of honours in Honours courses or a letter grade in the General course. It will not be altered by marks obtained in supplemental examinations. Standing for the year will be granted as follows:

<table>
<thead>
<tr>
<th>Range of Average Mark</th>
<th>Honours Course</th>
<th>General Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 - 100</td>
<td>First Class Honours</td>
<td>A</td>
</tr>
<tr>
<td>66 - 74</td>
<td>Second Class Honours</td>
<td>B</td>
</tr>
<tr>
<td>60 - 65</td>
<td>Third Class Honours</td>
<td>C</td>
</tr>
<tr>
<td>50 - 59</td>
<td></td>
<td>D</td>
</tr>
</tbody>
</table>

8. A student who fails more than two subjects at the annual examinations fails his year. He is not eligible for supplemental examinations. In cases where the Faculty Council considers that a student will not profit by further study, he will be notified with his examination results that he must withdraw from the Faculty of Science. Other failed students may repeat the year.

9. A student repeating a course must repeat all subjects in class unless exemption has been granted by the Dean and the Faculty Council.

10. Failure to write an examination is considered a failure to pass. A student who defaults a final examination, except for a properly certified reason, has no supplemental examination privilege and must 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 Office of the Registrar before the end of the examination period.

11. All examinations which receive a failing grade are automatically re-read.

12. To be eligible for supplemental examination a student:
(a) must have attended lectures in the course in which he proposes to write,
(b) must not have failed more than two full courses,
(c) must not have defaulted the final examination except for a properly certified reason.

13. A student who fails to obtain 40% in the final examination may be granted supplemental privileges only at the discretion of the Committee on Standings and Promotions.

14. Supplemental examinations will be held in August. Application for supplemental examinations must be filed before July 15, on forms provided by the Office of the Registrar. Fees for supplemental examinations must accompany the application. If the student subsequently decides not to write the examination, the fee is not refunded.

15. A student who has failed to obtain a clear pass after the supplemental examinations will have his case reviewed by the Committee on Standings and Promotions. If he has failed a supplemental examination in a non-prerequisite subject, he may be granted a pass standing conditioned in this subject, otherwise he must repeat the year.

16. A student who has been promoted with a condition in a subject from the previous year, must clear that condition before being promoted further. In special cases, and on petition to the Faculty Council, a student may be permitted to substitute another subject for one in which he is conditioned.

17. A student may not write supplemental examinations to raise his standing in subjects already passed, nor will the results of supplemental examinations be considered in arriving at a student's standing in his course.
# ACADEMIC PROGRAMMES

## First Year
(for all students whether Honours or General except Honours Applied Physics. For First Year Applied Physics see page 97)

<table>
<thead>
<tr>
<th>Course</th>
<th>Type</th>
<th>Lect.</th>
<th>Lab.</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 130</td>
<td>Types of English Literature</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Physics 131</td>
<td>Mechanics, Wave Motion, and Heat</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Chemistry 131</td>
<td>General Chemistry</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Mathematics 130</td>
<td>Calculus</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>One of (See Note 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics 131</td>
<td>Algebra and Solid Geometry</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Biology 131</td>
<td>An Introduction to Biology</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>(See Note 3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychology 100</td>
<td>Introduction to Psychology</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Mathematics 132</td>
<td>Numerical Procedures</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Geology 130</td>
<td>Introductory Geology</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note 1: Mathematics 131 is required for admission to General or Honours courses in the Physical sciences. Biology 131 is required for admission to all subsequent courses in Botany, Zoology, or Biology. These two subjects may both be taken, but in this case no subject is to be selected from the second group of options.

Note 2: Geology 130 is a recommended subject for students in the second year of the General Course planning a major in Biology.

Note 3: Students who have completed Grade 13 Botany and Zoology and obtained a minimum of 60% in these subjects may replace Biology 131 by Biology 231 - Genetics and Evolution.
THE GENERAL COURSE

The three year General Course is designed for students wishing to teach, to qualify for positions as senior technicians in laboratories of various types, or for those who desire a general background of information in the Sciences.

In the second and third year, the student will select his major field of study from one of the following departments: Biology, Chemistry, Mathematics, or Physics. He must have attained C standing in this field in his first year before he may choose the field for major study. He must attain C standing in this field in his second year for promotion to third year, and in his third year in order to graduate.

The curriculum is arranged as follows:

Year I—See Page 86.

Year II and Year III

Two subjects from a major group
One subject from a second group
One subject from a third group
One Arts subject

The selection of subjects in the second and third years will be restricted partly by the limitations on choice imposed by the timetable, and partly by the necessity in some subjects of having completed prerequisites. A student's programme must therefore be approved by the chairman of the department of his major field.

The subjects are grouped by departments as follows:

Group A: Biology

<table>
<thead>
<tr>
<th>Subject</th>
<th>Title</th>
<th>Lect.</th>
<th>Lab.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology 231</td>
<td>Genetics and Evolution</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Biology 431</td>
<td>Ecology</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Botany 231</td>
<td>Plant Anatomy and Morphology</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Botany 331</td>
<td>Plant Physiology</td>
<td>2</td>
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Group B: Chemistry

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Group C: Mathematics

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Group D: Physics

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Other Courses

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* Indicates a laboratory taken in alternate weeks.
Recommended Programmes

The following combinations of subjects have been recommended by the departments for major study in their fields. The timetable has been designed to ensure that these combinations are permitted. Other combinations of subjects may be taken if they fit the student's timetable and are approved by his department chairman.

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# HONOURS CHEMISTRY

*(For Year I, see page 86)*

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* Indicates a laboratory taken in alternate weeks.

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## HONOURS
### CHEMISTRY AND BIOLOGY

(For Year I, see page 86)

### Year II

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### Year III

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# Honours Chemistry and Physics

*For Year I, see page 86*

## Year II

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**Year III**

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**One of Option A or B**

- **A** Chemistry 231 Chemical Bonding and Structure | 2 | 0 |
- **B** Physics 331 Classical Mechanics II | 3 | 0 |

A15 11  
B16 11

## Year IV

<table>
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**Option A (Chemistry)**

- Chemistry 435 Physical Chemistry III | 2 | 1 |
- Chemistry 439 Advanced Laboratory | 0 | 3 |

**One of:**

- Chemistry 445 Polymer Chemistry | 2 | 0 |
- Chemistry 337 Biochemistry I | 2 | 0 |
- Arts Elective | 3 | 0 |

**Option B (Physics)**

<table>
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**One of:**

- Chemistry 435 Physical Chemistry III | 2 | 1 |
- Physics 436 Physical Mathematics II | 3 | 0 |
- Arts Elective | 3 | 0 |

* Indicates a laboratory taken in alternate weeks.
HONOURS
MATHEMATICS AND PHYSICS

MATHEMATICS MAJOR

(For Year I, see page 86)

<table>
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Year III (Pure Mathematics Option)

| Mathematics 330 | Euclidean and Projective Geometry | 3 | 0 |
| Mathematics 331 | Algebra II                        | 2 | 0 |
| Mathematics 332 | Theory of Functions               | 3 | 0 |
| Mathematics 333 | Differential Equations            | 2 | 0 |
| Two Additional Mathematics Courses |       |      |
| One Science Elective |       |      |
| One Non-Science Elective |      |      |

(Statistics Option)

| Mathematics 331 | Algebra II                        | 2 | 0 |
| Mathematics 332 | Theory of Functions               | 3 | 0 |
| Mathematics 334 | Numerical Methods                 | 2 | 2 |
| Mathematics 335 | Finite Differences                | 2 | 0 |
| Two of:         |                                   |    |    |
| Mathematics 330 | Euclidean and Projective Geometry | 3 | 0 |
| Mathematics 333 | Differential Equations            | 2 | 0 |
| Mathematics 336 | Life Contingencies                | 2 | 0 |
| Mathematics 338 | Mathematical Statistics           | 2 | 0 |
| One Science Elective |       |      |
| One Arts Elective |       |      |

(Applied Mathematics Option)

<p>| Mathematics 331 | Algebra II                        | 2 | 0 |
| Mathematics 332 | Theory of Functions               | 3 | 0 |
| Mathematics 333 | Differential Equations            | 2 | 0 |
| Mathematics 334 | Numerical Methods                 | 2 | 2 |
| Mathematics 337 | Advanced Mechanics                | 2 | 0 |
| Mathematics 339 | Electromagnetism I                | 2 | 0 |
| One Science Elective |       |      |
| One Non-Science Elective |      |      |</p>
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Elective course both in Mathematics and outside Mathematics should not be selected by the student before consultation with the Chairman of the Department of Mathematics.

**Science Electives for the third and fourth years:**

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**Non-Science Electives for the third and fourth years:**

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**Note:**

1. Any other course may be substituted as an elective if it fits the student's time-table and is approved by the Chairman of the Department of Mathematics.
2. Students completing this course may qualify for the High School Assistant's Certificate, Type "A", in Mathematics.
3. Students wishing to qualify for High School Assistant's Certificate, Type "A", in Mathematics and Physics must choose courses in Physics for their Science elective in Years III and IV.
HONOURS
MATHEMATICS AND PHYSICS
PHYSICS MAJOR

(For Year I, see page 86)

Year II

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Year III

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Year III (Teaching Option)

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## HONOURS APPLIED PHYSICS

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<td>Physics 335</td>
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<tr>
<td>EE 51</td>
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<tr>
<td>Circuit Theory I</td>
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<tr>
<td>Intermediate Laboratory</td>
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<tr>
<td>Atomic and Nuclear Physics I</td>
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<tr>
<td>Thermodynamics</td>
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<td>Electronics I</td>
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### Year III—Term B

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<th>Course</th>
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<tbody>
<tr>
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<td>Intermediate Laboratory</td>
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<tr>
<td>Atomic and Nuclear Physics I</td>
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<td>Statistical Mechanics, Kinetic Theory of Gases</td>
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### Year IV—Term A & B

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<tr>
<td>Solid State Physics</td>
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6 hours from: Physics 442 (Metal Physics), Physics 42 (Structure of Solids), Mathematics 55 (Digital Computer Programming), Physics 432 (Advanced Electronics), Mathematics courses Engineering courses, one Arts Elective

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FACULTY OF GRADUATE STUDIES
DEGREES

Courses leading to the degree of Master of Arts (M.A.) are offered by the department of German, History, and Mathematics.

Courses leading to the degree of Master of Science (M.Sc.) are offered by the departments of Biology, Chemistry, Mathematics, and Physics.

Courses leading to the degree of Master of Applied Science (M.A.Sc.) are offered by the departments of Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering.

Courses leading to the degree of Doctor of Philosophy (Ph.D.) are offered by the departments of Civil Engineering, Electrical Engineering, Mechanical Engineering, Mathematics, and Physics.

Other departments are planning to offer graduate programmes in the near future. Detailed information concerning specific courses may be obtained from the Dean of the Faculty.

Requirements for the Master's Degree

Each candidate for the Master's Degree shall have his programme approved by the Committee on Programmes for the Master's Degree.

Four full courses, acceptable for graduate credit, or two such courses and a thesis, are required for the Master's Degree. The subject of the thesis research must be approved by the head of the department concerned. Four copies of the candidate's thesis shall be submitted to the Dean of Graduate Studies.

In the case of a student proceeding to the Master's Degree without writing a thesis, it is recommended that one of the four courses of graduate work be obtained outside his own special field of study and preferably outside his own department. These are minimal requirements and any additional departmental regulations are specifically listed along with the course offerings of the department concerned. Students must obtain an average of at least 66% in the set of courses which they present in fulfillment of course requirements for the degree.

The minimum time of registration for the Master's Degree is one academic year from an honours Bachelor's Degree or equivalent. If a candidate is employed in other work that requires more than approximately 15 hours per week, he will not be able to complete the requirements in the minimum time. The requirements for the degree must be completed within a total period of four consecutive academic years.

In exceptional circumstances, extensions may be made beyond the maximum time allowance upon petition to the Graduate Council at least four months prior to the normal date for completion of degree requirements.
Requirements for the Ph.D. Degree

The candidate must have an adequate knowledge of at least one foreign language, as specified by the department with which he is enrolled.

The candidate shall sit for comprehensive examinations, as determined by the department in which he is enrolled. The amount of course work which the candidate shall take will be determined by the department, but will normally not be more than four courses beyond the Master's level. Students must obtain an average of at least 66% in the set of courses which they present in fulfillment of course requirements for the degree.

Each candidate shall have his programme of study approved by a Committee, and will be responsible to a thesis supervisor who shall be appointed from the Faculty of Graduate Studies.

The candidate shall present a thesis embodying the results of original research conducted by himself on an approved topic. Four copies of the candidate's thesis shall be submitted to the Dean of Graduate Studies to be read and judged by two members of the University Faculty and an outside examiner, who will be appointed by the Dean of Graduate Studies.

The candidate shall defend his thesis in an oral examination before a Committee appointed by the Faculty of Graduate Studies.

The minimum period of registration for the Doctor's Degree is three academic years from an honours Bachelor's Degree, or, alternatively, two academic years from a Master's Degree or equivalent. If a candidate is employed in other work that requires more than approximately fifteen hours per week, he will not be allowed to complete the requirements in the minimum time. The requirements for the degree must be completed within a total period of six consecutive academic years from the Bachelor's level or five consecutive academic years from the Master's level.

In exceptional circumstances, extensions may be made beyond the maximum time allowance upon petition to the Graduate Council at least four months prior to the normal date for completion of degree requirements.
ADMISSION AND REGISTRATION

General

Application for admission to the Faculty of Graduate Studies should be made as early in the year as possible on forms provided by the Office of the Registrar. Academic transcripts and other supporting documents should be forwarded as soon as they become available.

Admission to the Faculty cannot be granted until all requirements have been met and all documents submitted.

Admission

Applicants for Graduate Study must be admitted by the Admissions Committee on Graduate Studies.

Only students who are graduates of approved universities and colleges are eligible for admission to Graduate Studies. In addition, the department of the University of Waterloo in which the applicant intends to pursue graduate studies must approve his application and his proposed programme.

Students who, in the opinion of the Committee on Programmes for the Master's Degree, have insufficient background to permit them to complete the requirements for the degree in one academic year, will be required to take a programme extending over at least two academic years.

The candidacy of each applicant for a Doctoral Degree must be approved by the Admissions Committee regardless of the institution at which the candidate has completed his previous work.

At the discretion of the Admissions Committee, an applicant may be required to write a set of qualifying examinations.

Admission of Students from Other Countries

Students from other countries where English is not the common language must provide certified translations of academic transcripts. In addition, the applicant may be required to take either "The English Proficiency Tests" prepared by the English Language Institute of the University of Michigan, or the examinations for "The Certificate of Proficiency in English" of the University of Cambridge, in order to satisfy the Admissions Committee that his knowledge of the English language is adequate to pursue his studies successfully. The expenses involved in administering the test must be borne by the applicant.

Re-Admission

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 progressing satisfactorily.

Registration

All students are required to register at the commencement of each session at the time and place designated by the Registrar.
FEES

All fees for the academic year are due and payable on the day of registration. If, for reasons acceptable to the Business Manager, the fees for the year cannot be paid in full on the day of registration, they may be paid in two instalments, but an extra charge of $5.00 will then be added to the total fee. The first instalment, to be paid on the day of registration, is a minimum of 60% of the total fees. The balance must be paid in full on the first day of the second term. (Special arrangements are available for graduate students employed by the University.)

A charge of $2.00 per month will be made on overdue accounts.

A student who finds it necessary to withdraw from attendance is required to obtain a withdrawal voucher from the Registrar. The voucher, when signed by the Registrar, may entitle him to a refund of a portion of his fees. No fee will be refunded unless this procedure is followed.

Refunds of tuition fees are made at the discretion of the University.

Incidental fees are not refundable.

Fees

Full-time graduate students, for each year of residence $300.00
Thereafter for each year of registration until the Degree requirements are fulfilled 50.00
Fee per course (part-time students) 100.00
Health Insurance 6.50

This plan does not include the premiums or benefits of the Ontario Hospital Services Commission. Ontario Hospital Services coverage is the student's own responsibility. Students participating in any athletics are also responsible for their own coverage under the Ontario Hospital Services Commission.

Miscellaneous Fees

Late Registration 10.00
Transcript of Record 1.00
Degree 20.00

The Board of Governors reserves the right to make changes in its published schedule of fees without notice.
EXAMINATIONS

Examinations

Letter grades will be used to designate standing in individual subjects.

A  75 - 100%
B  66 - 74%
C  60 - 65%
F  less than 60% (failure)

Students must obtain an average of at least 66% in the set of courses which they present in fulfillment of course requirements for any graduate degree.
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COURSES OF STUDY
NOTES ON NUMBERING OF COURSES

1. Courses offered to students in the Faculties of Arts and Science numbered:
   - 1-49 are at the beginning level
   - 50-99 are at the Ontario Grade XIII level
   - 100-500 are at the undergraduate level

Courses offered to students in the Faculty of Engineering numbered:
   - 1-9 are at the Ontario Grade XIII level
   - 10-99 are at the undergraduate level

Courses offered to students in the Faculty of Graduate Studies numbered:
   - below 600 are senior undergraduate courses which may be taken for Graduate credit
   - 600 and above are at the graduate level

2. All courses listed are full courses (two terms) unless otherwise indicated.

3. A symbol following a course number indicates that the course is offered by one of the associated church colleges:
   - J-St. Jerome's College
   - R-Renison College
   - P-St. Paul's College

NOTES ON FACULTY LISTING

Members of faculty as of February 1, 1963 are listed by departments.
BIOLOGY

G. Power, B.Sc. (Durham), Ph.D. (McGill)

Assistant Professor and Acting Chairman of the Department

H. R. N. Eydt, M.Sc., Ph.D. (McMaster)  -  -  -  -  -  -  -  Assistant Professor

P. E. Morrison, M.Sc. (Western)  -  -  -  -  -  -  -  -  -  -  Assistant Professor

31. Biology for Engineers. An introduction to the study of biology by the case history method with emphasis on the effects of environmental manipulation.
2 lectures, 1 hour laboratory, one term.

2 lectures, 3 hours laboratory.

231. Genetics and Evolution. The principles, methods, and application of genetics. The implications of genetics in the modern evolutionary theory.
2 lectures, 2 hours laboratory.

2 lectures, 2 hours laboratory.

601. Water Pollution Biology. A lecture, seminar, and practical course providing an introduction to the biological, chemical and engineering aspects of water pollution.

602. Fisheries Biology. A lecture and seminar course dealing with the basic techniques of fisheries biology and reviewing the significant literature in the field.

603. Paleobotany. A course dealing with the evolution of the plant kingdom, with emphasis upon the Fern-Pteridosperm complex and microfossils in the Pleistocene. Aspects of Phylogeny and paleobotany are studied.

604. Advanced Physiology. A seminar and reading course covering certain aspects of physiology and metabolism, growth and differentiation, with particular emphasis on selected topics in the field of the student’s research.

BOTANY

231. **Plant Anatomy and Morphology.** The anatomy, morphology and taxonomy of the plant kingdom, with the life histories of typical examples.
2 lectures, 3 hours laboratory.

331. **Plant Physiology.** Study of respiration, photosynthesis, water relationships, nutrition, growth factors, etc., as fundamental physiological processes of the plant.
2 lectures, 3 hours laboratory.

431. **Microbiology.** A survey of microorganisms with special reference to the morphology, physiology and taxonomy of bacteria; also the microbiology of special environments.
2 lectures, 3 hours laboratory.

ZOOCLOGY

231. **Vertebrate Zoology.** The evolution of the vertebrate body as exemplified by both living and fossil members of the group. Laboratory dissections form an integral part of the course.
2 lectures, 3 hours laboratory.

332. **Vertebrate Physiology.** An integrated study of the concepts of the cell and its environment and the basic processes of living cells. The physiology of major organ systems of the vertebrate body with emphasis on the human.
2 lectures, 3 hours laboratory.

431. **Invertebrate Zoology.** A survey of the major invertebrate Phyla with emphasis on the anatomy, taxonomy, and ecology of selected representatives.
2 lectures, 3 hours laboratory.
CHEMICAL ENGINEERING

L. E. Bodnar, Ph.D. (McMaster)
Associate Professor and Acting Chairman of the Department

T. L. Batke, M.A.Sc., Ph.D. (Toronto) - - - Professor, Academic Vice-President

A. H. Heatley, M.A., Ph.D. (Toronto) - - - - - - Professor

G. A. Coulman, B.S. (Case Institute of Technology), M.S. (Michigan), Ph.D. (Case Institute of Technology) - - - - - - Assistant Professor

K. Enns, LL.B., M.A.Sc. (Toronto) - - - - - - Assistant Professor

D. C. T. Pei, B.Eng. (McGill), M.Sc. (Queen's), Ph.D. (McGill) Assistant Professor

11. Chemical Process Principles I. Practice in applied stoichiometry. Mass and energy balances. The simple unit operations such as evaporation, drying, etc. Prerequisite: Chem 11. 3 lectures, 2 hours laboratory, problems, one term.

12. Chemical Process Principles II. Introduction to the unit operation concept. The mass and energy balance, utilizing physical-chemical principles, will be applied to the elementary unit operations of solution, dilution, evaporation, etc. Preliminary studies of the stage concept will be presented. Dimensional analysis and modeling are incorporated. Prerequisite: ChE 11. 2 lectures, 2 hours problems, one term.

13. Unit Operation Analysis. Analysis and functional design of processing units for distillation, absorption, extraction, drying, humidification, leaching and crystallization. Prerequisites: ChE 12, ChE 21. 2 lectures, 2 hours problems, one term.

21. Transport Processes I. The transport concept is introduced as a general theory. Fluid dynamics and heat transfer are presented from a co-ordinated basis of transport phenomena and thermodynamics. Prerequisite: ChE 11. 3 lectures, 2 hours problems, one term.

22. Transport Processes II. Theory of diffusion, Navier-Stokes equations, inter-phase mass transport, phase transformation, simultaneous heat and mass transport and the analogy between them. Prerequisite: ChE 21. 2 lectures, 2 hours problems, one term.

23. Transport Processes III. Momentum, energy, and mass transport phenomena and their inter-relationships. Prerequisite: ChE 22. 3 lectures, 2 hours problems, one term.

31. Physical-Chemical Principles. Properties of solids, liquids, and gases. Introduction to thermodynamics and chemical kinetics with simple applications. The phase rule. Prerequisite: Chem. 11. 3 lectures, 3 hours laboratory, alternate weeks, one term.
Prerequisites: ChE 11, ChE 31.
3 lectures, one term.

Prerequisite: ChE 32.
3 lectures, 2 hours problems, one term.

34. **Thermodynamics III.** Physical and chemical equilibria of multicomponent systems. Introduction to statistical thermodynamics.
Prerequisite: ChE 33.
3 lectures, 2 hours problems, one term.

41. **Reaction Kinetics I.** Introduction to kinetics and mechanism of elementary chemical processes in homogeneous systems; reversible, consecutive and simultaneous reactions, interpretation of kinetic data, homogeneous catalysis, chain reactions.
Prerequisites: ChE 12, ChE 31.
3 lectures, one term.

42. **Reaction Kinetics II.** Design of homogeneous batch and flow reactors; material balance in flow systems, differential and integral tubular reactors, graphical and algebraic methods for stirred reactor batteries.
Prerequisite: ChE 41.
3 lectures, one term.

43. **Reaction Kinetics III.** Non-isothermal batch and flow reactors, semi-flow processes, heterogeneous reactions, scale up principles for reactors involving heat and mass transfer.
Prerequisite: ChE 42.
3 lectures, one term.

51. **Process System Theory I.** A co-ordinated approach to linear systems analysis is presented in an engineering format. The physical phenomena of the several fields are presented as analogs to establish a useful basis for system analysis in the process industries.
Prerequisites: Math 41, ChE 22.
3 lectures, one term.

52. **Process System Theory II.** The material of Process System Theory I is extended to more complex processes. Closed loop systems are examined for stability. Advanced concepts in control systems are introduced.
Prerequisite: ChE 51.
2 lectures, 3 problems, one term.

53. **Process Dynamics and Control.** An examination of advanced control methods and their impact on process dynamics.
Prerequisite: ChE 52.
3 lectures, one term.

61. **Industrial Economics.** Market surveys, estimation of capital and operating costs of a new product or process. Economic feasibility studies and projected economic evaluation for processes in the various stages of research, development, and design. Appraisal of capital expenditures.
Prerequisite: ChE 12.
2 lectures, one term.
62. **Process System Design.** The undergraduate curriculum is co-ordinated and brought together to accomplish the basic objective of the process engineer, the design of an integrated chemical process.  
Prerequisites: All Chemical Engineering required courses.  
2 lectures, 3 hours problems, one term.

71. **Chemical Engineering Laboratory I.** Experiments in the application of physical and chemical principles to engineering analysis, phase equilibrium, fluid flow and heat transfer.  
Prerequisites: ChE 12, ChE 21.  
4 hours laboratory, one term.

72. **Chemical Engineering Laboratory II.** Experimental studies with pilot plant equipment in the representative unit operations: evaporation, distillation, absorption, extraction, drying, humidification and reactors.  
Prerequisites: ChE 13, ChE 71.  
6 hours laboratory, one term.

73. **Chemical Engineering Laboratory III.** Chemical reactors, process dynamics steady-state and transient behaviour, and applications of digital and analog computers.  
Prerequisites: ChE 72, ChE 41, ChE 51.  
6 hours laboratory, one term.

91. **Seminar.** Study and presentation of material in recent literature.  
1 hour, one term.

98. **Research and Design Project I.**  
3 hours, one term.

99. **Research and Design Project II.**  
Prerequisite: ChE 98.  
9 hours, one term.

601. **Applied Chemical Kinetics and Reactor Design.** A study of the kinetics of homogeneous and heterogeneous, catalytic and non-catalytic reactions. Primary emphasis is placed upon predicting the course of chemical reactions under the conditions of process operations and the application of the principles of reactions kinetics, heat, and mass transfer to the design of chemical reactors.  
one term.

602. **Thermodynamics.** A treatment from the engineering viewpoint of the volumetric and phase behaviour of pure substances and multicomponent systems at physical and chemical equilibrium. Estimation of thermodynamic properties from a knowledge of molecular structure. Emphasis will be on the application of these principles to the solution of problems in industrial practice.  
one term.

611. **Advanced Topics in Heat Transfer.** Analysis of unsteady state heat transfer in complex systems. Examination of high velocity and/or high temperature systems. Coupled mass and heat transfer as in boiling, transpiration and ablation.  
one term.

621. **Process Optimization.** The definition of the optimization problem in design and control. Introduction to applications of steepest ascent, calculus of variations and mathematical programming.  
one term.

622. **Process Dynamics.** Dynamic characterization of the process complex by experimental and simulation techniques. Non-linear, distributed parameter, positive feedback effects. Dynamics as a tool in advanced process theory and analysis.  
one term.

699. **Thesis.**
CHEMISTRY

W. A. E. McBryde, M.A. (Toronto), Ph.D. (Virginia)
Professor and Chairman of the Department, Dean of the Faculty of Science

W. F. Forbes, Ph.D., (London), D.I.C. - - - - - Professor
R. M. Guest, M.A. (Western), Ph.D. (McGill) - - - Associate Professor
J. B. Capindale, B.A., D.Phil. (Oxford) - - - Assistant Professor
W. L. Elsdon, M.Sc. (Western), Ph.D. (McGill) - - - Assistant Professor
D. E. Irish, B.Sc. (Western), M.Sc. (McMaster), Ph.D. (Chicago) Assistant Professor
J. R. Mills, M.A. (Toronto), Ph.D. (Illinois) - - - Assistant Professor
J. B. Moffat, B.A., Ph.D. (Toronto) - - - Assistant Professor
D. Mackay, B.Sc., Ph.D. (Aberdeen) - Assistant Professor (on leave of absence)
R. G. Woolford, M.Sc. (Western), Ph.D. (Illinois) - - Assistant Professor
G. F. Atkinson, M.A., Ph.D. (Toronto) - - - - Lecturer
(Mrs.) D. A. Brisbin, B.Sc. (Alberta), Ph.D. (Toronto) - - - Lecturer

5. Introductory Chemistry. Fundamental theories, laws, and principles of general chemistry. Study of some non-metallic and metallic elements and their compounds illustrating the theory.
2 lectures, 4 hours laboratory.

3 lectures, one term.

21. Inorganic Chemistry. Systematic inorganic chemistry based on the periodic classification, with emphasis on the relationship between properties and structure.
3 lectures, one term.

1 lecture, 3 hours laboratory, one term.

3 lectures, one term.

26. Organic Chemistry I. The basic chemistry of the important classes of aliphatic and aromatic compounds.
3 lectures, one term.

3 lectures, one term.
35. **Electrochemistry.** Electrolytic conductance and transport. Thermodynamics of electrolytic solutions. Electrode potentials. The measurement of pH. Metallic corrosion. Prerequisite: ChE 32, Chemistry 22. 3 lectures, 3 hours laboratory alternate weeks, one term.

36. **Organic Chemistry II.** An introduction to the important classes of heterocyclic compounds and natural products. A laboratory course on preparative organic chemistry and organic techniques accompanies the lectures. Prerequisite: Chemistry 26. 3 lectures, 3 hours laboratory, one term.

37. **Biochemistry.** Carbohydrates, lipids, proteins, hormones, nucleic acids, and vitamins. Metabolism of these groups of compounds. Physics-chemical aspects of biochemistry. Prerequisite: Chemistry 36. 3 lectures, one term.

41. **Nuclear Chemistry.** Structure, properties and reactions of nuclei. Quantitative treatment of radioactive processes. Radiation detection and measurement. Chemical applications. 3 lectures, one term.

46. **Organic Chemistry III.** Selected topics on the chemistry of organic compounds of industrial interest. Prerequisite: Chemistry 36. 3 lectures, one term.

55. **Polymer Physics and Chemistry.** The chemistry and physics of natural and synthetic polymers, covering the following topics: condensation and addition polymers and their reaction kinetics; properties of polymers, their measurement and relation to structure; isotactic polymers, copolymers, and polymer reactions. Prerequisite: 3 lectures, one term.

131. **General Chemistry.** Elementary study of the states of matter, changes of state, solution laws; atomic structure and bonding; stoichiometry of equations, oxidation-reduction, chemical equilibria; descriptive chemistry of the commoner elements in terms of the periodic table. 3 lectures, 3 hours laboratory.

222. **Qualitative Analysis.** The principles of chemical separations and analysis: solubility product, ionization of weak acids and bases, hydrolysis or ions, formation of complex ions, oxidation-reduction. Reactions of the more common ionic species inaqueous solutions. The practical work consists of separation and detection of common cations and anions. Prerequisite: General Chemistry. 2 lectures, 3 hours laboratory. (Summer session only).

231. **Chemical Bonding and Structure.** Electronic structure of atoms; the periodic table; nature and classification of chemical bonding; bond energies and electronegativity scales; structure and shape of molecules; crystal structure of common inorganic substances. 2 lectures (For General students, 1 hour problem).

232. **Analytical Chemistry.** Theory and practice of elementary quantitative inorganic analysis; experiments to illustrate gravimetric, titrimetric, and absorptiometric methods; introduction to various methods of separation. 2 lectures, 6 hours laboratory.
235. Physical Chemistry I. An introduction to chemical thermodynamics including the laws of thermodynamics applied to simple systems of fixed composition. Approximately ten hours of the course will be devoted to an introduction to the phase rule. 2 lectures, 1 hour problems.

236. Organic Chemistry I. The properties, preparations, reactions, and basic structural theory of the common classes of aliphatic and aromatic compounds. A laboratory course on preparative organic chemistry accompanies the lectures. 2 lectures, 3 hours laboratory.

325. Physical Chemistry. An introduction to the study of matter from the macroscopic and molecular point of view. Classical kinetic theory of gases, thermodynamics, electrochemistry, kinetics, molecular structure, surface phenomena, phase equilibria and macromolecules. 2 lectures, 3 hours laboratory.

331. Inorganic Chemistry I. Systematic inorganic chemistry stressing general forms of behaviour and periodic trends among the elements. Descriptive chemistry will be presented in part through reading assignments. The accompanying laboratory will illustrate methods of synthesis; analytical tests of products; and determination of composition, structure, and physical constants. 2 lectures, (For General students, 3 hours laboratory).

335. Physical Chemistry II. The rate laws of elementary kinetics, complex reactions and catalysis. Electrochemistry and the thermodynamics of non-electrolytes. 2 lectures, 6 hours laboratory.

336. Organic Chemistry II. Chemistry 236 expanded to stress enolate condensations and alicyclic compounds, stereochemistry, and reaction mechanisms. The laboratory course includes further preparative work and qualitative organic analysis. 2 lectures, 3 hours laboratory.

337. Biochemistry I. Carbohydrates, lipids, proteins, hormones, nucleic acids, and vitamins. Metabolism of these groups of compounds. Physico-chemical aspects of biochemistry. 2 lectures. (For General students, 3 hours laboratory).

431. Inorganic Chemistry II. Selected topics in inorganic chemistry including co-ordination chemistry, mechanisms of inorganic reactions, nuclear and radiochemistry, non-aqueous solvent systems, high-temperature chemistry. The laboratory course includes preparation of typical inorganic compounds and physical measurements to establish structure and stability of these. 2 lectures, 6 hours laboratory.

435. Physical Chemistry III. The thermodynamics and kinetics of surface phenomena. An introduction to the fundamentals of quantum and statistical mechanics with applications to rate theories and small molecules. 2 lectures, 1 hour laboratory.

436. Organic Chemistry III. A selection of more advanced topics to include heterocyclic compounds, natural products, and theoretical aspects of organic chemistry. 2 lectures.

437. Biochemistry II. Selected topics and techniques in modern biochemistry; energy transfer, transport across membranes, comparative aspects of metabolism, mechanism and kinetics of enzyme activity, structural macromolecules. 2 lectures, 3 hours laboratory.

439. Advanced Laboratory. Physical chemistry; or organic chemistry; or inorganic chemistry, for students in Honours Chemistry and Physics (cf. course 431). Three hours may be in Biochemistry (cf. course 437). Chem. students, 6 hours laboratory. Chem. & Phys. students, 3 hours laboratory.
CURRICULA AND COURSES OF STUDY

445. Polymer Chemistry. The chemistry and physics of natural and synthetic polymers, covering the following topics: condensation and addition polymers and their reaction kinetics; properties of polymers, their measurements and relation to structure; isotactic polymers, copolymers, and polymer reactions. 2 lectures.


632. Chemical Analysis. An advanced treatment of classical analysis. The application of equilibria and kinetic considerations to the study of deviations from stoichiometric behaviour. The formation and nature of precipitates, non-aqueous solvent methods, analytical separations.

635. Thermodynamics. A rigorous treatment of chemical thermodynamics with emphasis on the complete thermodynamic description of a system.

636. Natural Products. Selected topics in the field of natural products stressing the use of spectral and other physico-chemical methods in the determination of structure.


642. Chemical Instrumentation. Instrument components and optimum application; rudiments of design; electrical, spectral, migrational and other methods.

645. Quantum Chemistry. The fundamentals of quantum chemistry with applications to the solution of the wave equation for simple molecules and the solution by approximate methods for large molecules.

646. Theoretical Organic Chemistry. The structure and reactivity of organic molecules emphasizing stereochemistry and reaction mechanisms.


665. Chemical Spectroscopy. Introduction to ultraviolet, infrared, and resonance spectroscopy, with emphasis on applications to studies of organic molecules.

CIVIL ENGINEERING

D. T. Wright, B.A.Sc. (Toronto), M.S. (Illinois), Ph.D. (Cambridge)
Professor and Chairman of the Department, Dean of the Faculty of Engineering

S. T. Ariaratnam, B.Sc., B.Sc. (Eng.) (Ceylon), M.Sc. (London), Ph.D. (Cambridge)
Associate Professor

N. C. Lind, M.Sc. (Royal Technical University of Denmark), Ph.D. (Illinois)
Associate Professor

A. N. Sherbourne, B.Sc. (London), M.S. (Lehigh), M.A., Ph.D. (Cambridge)
Associate Professor

W. R. Drynan, B.A.Sc. (Toronto), M.S., Ph.D. (Texas)
Assistant Professor

C. P. Fisher, M.A.Sc. (Toronto), O.L.S.
Assistant Professor

W. A. McLaughlin, B.Eng. (Saskatchewan), M.S. (Purdue)
Assistant Professor

H. B. Poorooshasb, B.Sc. (Manchester), Ph.D. (Cambridge)
Assistant Professor

J. D. Scott, B.Sc. (Queen's), M.S. (Illinois)
Assistant Professor

A. T. Cairncross, B.Sc. (Queen's)
Lecturer

R. Green, B.Sc. (Eng.) (London), M.Sc. (Queen’s), M.Sc. (Waterloo)
Lecturer

V. K. Handa, B.Sc. (Calcutta), B.Sc. (Eng.) (London), M.Sc. (Queen’s), M.Sc. (Waterloo)
Lecturer

B. G. Hutchinson, B.E. (Sydney), M.Sc. (Queen's)
Lecturer

P. H. Meincke, B.Sc. (Manitoba)
Lecturer

T. H. Topper, B.A.Sc. (Toronto), Ph.D. (Cambridge)
Lecturer

O. L. White, B.Sc. (Melbourne), M.A.Sc. (Toronto)
Lecturer (on leave of absence)

11. Engineering Graphics I. The course is designed to teach manipulation of drawing instruments and to develop manual drafting skills. Problems include orthographic, axonometric, oblique, isometric, and perspective methods of graphic presentation. 4 hours, one term.

12. Engineering Graphics II. This course supplements the course in Engineering Graphics I with further instruction in graphical methods. Graphical methods for solving problems involving vector quantities. The design, construction, and use of graphs and special charts, with various applications. The use of specially graduated scales, and the design of slide rules and nomograms. Graphical and mechanical methods of integration. Prerequisite: CE 11. 4 hours, one term.

21. Mechanics of Deformable Solids I. Review of statics. An analytical treatment of the resistance of materials, commencing with definitions of strains, stress, and properties of idealized materials. Mohr’s circle for stresses. Elastic and plastic behaviour of members subjected to axial, shearing, torsional and flexural deformations. Columns, statically indeterminate systems, and combined stresses are also treated. 3 lectures, 2 hours problems, one term.
Prerequisite: CE 22.
2 lectures, one term.

Prerequisite: CE 21.
2 lectures, 3 hours laboratory, alternate weeks, one term.

Prerequisite: CE 31.
3 lectures, 3 hours laboratory, alternate weeks, one term.

Prerequisites: CE 22, 32.
3 lectures, 3 hours problems or laboratory, one term.

34. Behaviour of Plain and Reinforced Concrete. Physical and chemical properties of cements, water, and admixtures; design of concrete mixes, workability, strength, and durability; field procedures and control; laboratory work on test procedures and concrete technology. Behaviour, analysis and design of structural elements; beams, tension and compression members, design of simple structures; experimental studies of structures.
Prerequisites: CE 31, 51.
3 lectures, 3 hours problems or laboratory, one term.

Prerequisites: CE 33, 34.
2 lectures, 1 seminar, one term.

3 lectures, 6 hours field work, one term.

42. Surveying and Photogrammetry. Advanced topics in surveying and photogrammetry. Aerial triangulation, theory of stereoplotters, stereotopographic mapping, application of photogrammetry other than from aerial photographs.
Prerequisite: CE 41.
3 lectures, one term.
51. Geology for Engineers. An introductory course in geology, with emphasis on topics particularly related to civil engineering: mineralogy (particularly clay mineralogy), petrology, aggregates, structural geology, geomorphology (especially glacial geology), and ground water. Laboratory work will include the identification of minerals and rocks and the study of the use of geological maps for engineering purposes. Weather permitting, field trips may be undertaken in addition to the laboratory sessions.
3 lectures, 3 hours laboratory alternate weeks, one term.

52. Soil Mechanics. Identification and classification of soils, index properties, capillarity and permeability, frost action, compaction, compressibility and consolidation, stress distribution, shear strength, pore pressure parameters, character of natural soil deposits, subsurface exploration and sampling, case histories. The lecture course is supplemented by a series of laboratory experiments on the techniques and interpretation of soil tests.
Prerequisite: CE 51.
3 lectures, 3 hours laboratory, one term.

53. Foundations and Earth Structures. Soil investigation and surveys, shear strength-time relationships, flow nets, slope stability, earth dams, earth pressure theories, earth retaining structures, bearing capacity theories, bearing capacity and settlement with relation to shallow and deep foundations.
3 lectures, one term.

61. Highway Engineering I. The planning, economics, finance, location, and design of transportation facilities. Highway and airport pavements, loads and stress distribution, soil strength, soil stabilization, drainage, behaviour and design of flexible and rigid pavements. The lecture course is supplemented by laboratory experiments on highway materials.
Prerequisite: CE 52.
3 lectures, 3 laboratory, alternate weeks, one term.

Prerequisite: CE 61.
3 lectures, one term.

71. Water Resources Engineering. General introduction to the physical, chemical and biological bases of water treatment and waste water treatment and disposal. Principles of design and construction of facilities for the collection, treatment, and distribution of water, and the collection, treatment, and disposal of waste waters. The lecture course is supplemented by a series of laboratory experiments related to water quality measurement and process control.
3 lectures, 3 hours laboratory, one term.

72. Environmental Health Engineering. An introductory course to the engineering principles which form the basis of environmental sanitation. Environmental health problems of the community and of industry are considered, including water, food, and air supplies, disposal of human and industrial wastes, animal and arthropod vectors, lighting, ventilation, noise, accidents, industrial poisons, and ionizing radiations.
Prerequisite: CE 71.
3 lectures, one term.

81. Law, Contracts and Specifications. Engineering law. The design and composition of contracts and specifications.
2 lectures, one term.

82. Urban Planning. Urban and regional planning. The control and administration of land use for various purposes. Problems of regional planning and urban growth related to communications, etc.
Prerequisite: CE 61.
3 lectures, one term.
83. **Project Management.** Separation of planning and scheduling functions, traditional methods, arrow diagramming, calculation of earliest and latest event times, design, delivery, and capital restraints, critical path determination, scheduling and calendar dating, the data flow cycle, linear programming and operational analyses. 3 lectures, one term.

84. **Civil Engineering Design Studies I.** Design of civil engineering projects, building structures, bridges, highway and municipal engineering works. Emphasis is given to the interrelationship between design synthesis, and the various sciences and disciplines covered in the undergraduate course of studies. 6 hours, one term.

85. **Civil Engineering Design Studies II.** Advanced studies in civil engineering design synthesis, related to optional courses offered, and direction of special interest. 9 hours, one term.

86. **Research Project.** Introduction to research problems and procedures, in various areas of civil engineering, with particular relation to special interests in optional programmes of students concerned. 9 hours, one term.


640. Highway Engineering (Planning and Design). Highway Planning—method and results; classification, needs, sufficiency ratings; economics of location; highway finance; highway administration; geometric design of roads and streets—principles and methods.
one term.

641. Traffic Engineering. Basic characteristics of traffic, drivers, vehicles, volumes, speeds, delays, etc.; traffic studies; capacity determinations; traffic theory including interrelationships of land use and traffic; mathematical models.
one term.

642. Transportation Engineering (Urban Planning). Basic urban transportation studies including origin/destination, inventory, use, parking and transit studies; land use planning, travel desires; economics in urban transportation.
one term.

one term.

652. Measurement of Soil Properties. Laboratory and field work in soil sampling and testing. Measurement of soil mechanics parameters for design and research problems. Experiments include permeability, consolidation, direct shear, and triaxial shear.
one term.

653. Soil Engineering. A critical study by the consideration of case histories of the current procedures for design and construction of foundations, earth retaining structures and earth slopes.
one term.

654. Engineering Aspects of Surficial Soils. Use of geologic and pedologic information and airphoto interpretation principles and techniques in the prediction of engineering properties of soils and the planning of engineering soil surveys.
one term.

one term.

one term.

one term.

one term.
675. **Air Resources Engineering.** The principles of the field of air pollution; health, nuisance, agricultural, etc., aspects; causes and sources; characteristic emission rates, gas flow in ducts and chimneys; physical properties of particulate matter; engineering design of air cleaning equipment; public relations, control ordinances, and zoning; public administration.

one term.

681. **Environmental Sanitation.** Engineering problems in refuse collection and disposal, sanitation to suburbs, foods and milk sanitation, housing, industrial hygiene, and other environmental sanitation programmes.

one term.

698. **Special Directed Studies.**

one term.

699. **Thesis.**
CLASSICS

B. J. Graf, C.R., M.A. (Western) - - - - - Professor
F. G. Keleher, C.R., M.A. (St. Mary's, Kentucky) - - Associate Professor
P. Kerésztes, B.A. (Budapest), M.A. (Toronto) - - - - Lecturer
W. H. Schnarr, C.R., B.A. (St. Mary's, Kentucky) - - - - Lecturer
Sister M. Stella, S.S.N.D., B.A. (Toronto), M.A. (Catholic University) - Lecturer

Except for those numbered below 100, all the following courses are Honours courses, but are also open to students in General Arts.

GREEK

10. Introductory Greek. For students who have not matriculated in Greek. Must be followed by Greek 100 in order to gain credit.
4 lectures.

100. Epic and Philosophy (to Plato). Homer, Iliad, I, VI, IX; Plato, Apology and Crito; prose composition and sight translation.
Prerequisite: Grade 13 Greek, Greek 10, or permission.
4 lectures.

250. Prose Composition and Sight Translation.
1 lecture.

3 lectures.

350. Prose Composition and Sight Translation.
1 lecture.

3 lectures.

370. Drama and Literary Criticism. Aeschylus, Agamemnon; Sophocles, Oedipus Tyrannos; Aristophanes, Clouds; Aristotle, Poetics.
3 lectures.

450. Prose Composition and Sight Translation.
1 lecture.

460. Philosophy and Political Theory: Plato and After. Plato. Republic (Selections) and Symposium; Aristotle, Ethics and Politics (Selections).
3 lectures.

3 lectures.

LATIN

10. Introductory Latin. For students who have not matriculated in Latin. Must be followed by Latin 100 in order to gain credit.
4 lectures.
50J. **Advanced Latin.** The Ontario Grade 13 curriculum will be followed.
4 lectures.

100. **Literature of the Republic.** Catullus (Selections); Cicero, *Pro Archia*; Vergil, *Eclogues* and *Georgics I, IV*; prose composition and sight translation.
Prerequisite: Grade 13 Latin, Latin 10, Latin 50J, or permission.
3 lectures.

250. **Prose Composition and Sight Translation.**
1 lecture.

260. **Letters and Epic.** Selections from the letters of Cicero and Pliny; Vergil, *Aenid II, IV, VI*.
3 lectures.

350. **Prose Composition and Sight Translation.**
1 lecture.

3 lectures.

370. **Lyric and Elegiac Poetry.** Horace, *Odes* and *Carmen Saeculare*, selections from Tibbulus, Propertius, and Ovid.
3 lectures.

450. **Prose Composition and Sight Translation.**
1 lecture.

3 lectures.

3 lectures.

**CLASSICAL CIVILIZATION (Courses in Translation)**

260. **Classical Literature in Translation.** Greek and Roman epic, drama, and verse.
3 lectures.

350. **Classical Art and Archaeology.** A survey of art and architecture from the Aegean age through the Roman Empire.
2 lectures.

370. **Myth, Religion, and Art.** Deities, myths, and sagas correlated with literature, religion, philosophy, politics, and art from the 6th century B.C. to the 4th century A.D.
2 lectures.
ECONOMICS

N. H. High, M.S., Ph.D. (Cornell)
Professor and Chairman of the Department, Dean of the Faculty of Arts

N. E. Lavigne, C.R., B.A. (Western), B.Comm. (Ottawa), M.B.A. (Detroit)
Associate Professor

F. C. Miller, M.A. (Western), Ph.D. (Clark)
Assistant Professor

R. E. Boston, M.Comm. (Toronto), Ph.D. (Michigan)
Lecturer (Part-time)

All the following courses are Honours courses, but any of them may be taken by students in General Arts, with the exception of Economics 450, 460 and 470.

100. Introduction to Economics. A general survey course in the Principles of Economics. Among the topics discussed are the determination of prices, the measurement and determination of the level of national income and employment, the monetary and banking system, public finance and fiscal policy, labour unions, international trade, and Canadian economic problems.
3 lectures.

3 lectures.

260. Economic History of North America. A study of the significance of economic factors in the growth of western civilization on the North American Continent with special reference to Canadian problems of staple production as shown in the fishing industry, the fur trade, lumbering, railroads and new techniques, wheat, mining, pulp and paper, and hydroelectric power.
3 lectures.

350. Money and Banking and National Income. A study of the American, British and Canadian banking systems with particular reference to Canadian, central banking and monetary policies since 1935. Some time is also devoted to a discussion of the measurement and determination of the level of national income, employment and prices, money flow accounts, monetary and business cycle theory, the theory of inflation and international monetary economics.
3 lectures.

351. Statistical Methods. Collection, processing and analysis of quantitative data, tabular and graphical presentation and analysis of statistical data, frequency distributions, probability, sampling, linear regression and correlation, construction and use of index numbers; time series analysis.
3 lectures.

355. International Economics. The following topics are discussed in the First Term: Balance of Payments Statistics; The Economic Basis of Trade and Investment; Foreign Exchange Rates and their Determination; Commercial Policy; International Investment and Foreign Aid.

The Second half of the course studies the theory of international trade and investment, with special reference to the problems of economic development.
3 lectures.

360. Labour Economics and Industrial Relations. The history of trade unionism, collective bargaining, and the economics of the labour market.
3 lectures.
365. **Public Finance and Fiscal Policy.** The place of public expenditures and revenue in the national economy, taxation, debt management, and the role of fiscal policy in economic stabilization. 3 lectures.


375. **National Income Analysis.** National Income Accounting; the Analysis of National Income; and, Problems of Economic Growth and Stability. 3 lectures.

450. **Advanced Economic Theory.** Analysis of the theories of representative economists. Most attention is given to the writings of Marshall, Chamberlain and Keynes. 3 lectures.

455. **History of Economic Thought.** A survey of the historical development of economic theory. 3 lectures.

460. **Mathematical Economics.** Mathematical formulation of economic theory; an introduction to dynamic models and their solution; the use of linear systems in economic analysis; and, introduction to input-output analysis and linear programming. 3 lectures.

470. **Canadian Economic Problems.** A seminar devoted to the discussion of current Canadian economic problems and policies. 3 lectures.
ELECTRICAL ENGINEERING

H. K. Kesavan, B.E. (Mysore), M.S. (Illinois), Ph.D. (Michigan State)  
Professor and Acting Chairman of the Department

R. G. Anthes, M.A.Sc. (Toronto)  -  -  -  -  -  Professor

L. Y. Wei, B.S. (National Northwestern College, China), M.S., Ph.D. (Illinois)  
Associate Professor

Y. Chow, B.S. (Taiwan College of Engineering), M.S. (Rhode Island)  
Assistant Professor (on leave of absence)

G. J. Dufault, B.A. (Ottawa), B.Sc. (Carleton)  -  -  -  -  Assistant Professor

J. S. Keeler, B.A.Sc. (Toronto)  -  -  -  -  Assistant Professor

W. N. Meikle, B.A.Sc. (Toronto)  -  -  -  -  Assistant Professor

W. F. McGee, M.A. (Toronto), Ph.D. (Illinois)  -  -  -  Lecturer

A. H. Qureshi, B.E. (Peshawar), Dr. Ing. (Aachen)  -  -  -  Lecturer

P. H. Roe, B.A.Sc. (Toronto), M.Sc. (Waterloo)  -  -  -  Lecturer

R. G. Van Heeswijk, Dipl. Ing. (Technological University of Delft)  -  Lecturer

W. J. Vetter, B.A.Sc. (Toronto), M.A.Sc. (Waterloo)  -  -  -  Lecturer


24. Logic and Switching I. The logical design of relay and electronic switching circuits. Boolean algebra. Algebraic equivalent of switching logic; tables of combinations. Relay contact networks, elementary diode, vacuum tube, transistor, and magnetic core switching circuits. Prerequisite: EE42, EE 52. 3 lectures, one term.

25. Logic and Switching II. A course in engineering principles of stored programme digital computers. Design of arithmetic sections, coding, control. Over-all logical organization and memory techniques. Prerequisite: EE 24. 3 lectures, one term.

31. Electromechanical Systems. The analysis of electromechanical, hydraulic, and thermal systems through the terminal characteristics and inter-connections of their components. Linear Graph and Matrix methods are used extensively. Prerequisite: Math 22. 3 lectures, 3 hours laboratory, one term.

32. Electronics. Principles and characteristics of vacuum and gas tubes, semiconductors, magnetic devices, and transducers; applications in industrial measurements and control. 3 lectures, 3 hours laboratory, one term.
41. Network Theory I. An introduction to the steady-state analysis of linear circuits—basic concepts of circuit parameters, series and parallel circuits and resonance, loop and nodal methods, network theorems.
Prerequisite: Math 22.
4 lectures, one term.

42. Network Theory II. Further study in steady-state extended to general analysis of circuits—balanced and unbalanced polyphase circuits, magnetically coupled circuits, complex waveforms, general forcing functions and transients.
Prerequisite: EE 41.
3 lectures, one term.

Prerequisite: EE 42.
2 lectures, one term.

44. Pulse and Switching Circuits. The analysis of circuits used in the generation and shaping of non-sinusoidal waveforms—linear and non-linear wave shaping and gating, voltage and current sweep generators, multivibrators and the blocking oscillator.
Prerequisite: EE 43, EE 53.
3 lectures, one term.

Prerequisite: EE 43, Math 44 or Math 45.
3 lectures, one term.

Prerequisite: Math 22.
3 lectures, one term.

Prerequisite: EE 51.
4 lectures, one term.

Prerequisite: EE 52.
2 lectures, one term.

Prerequisite: EE 53, EE 72.
3 lectures, one term.
55. **Solid State Electronics.** Crystal structure and imperfections; classical and quantum statistics, electron energy and distributions; Mobility and lifetime of electrons and holes; Current flows in semiconductor and in p-n junctions; Surface properties; Tunnel diode and parametric amplifiers.
Prerequisites: EE 43, EE 53.
3 lectures, one term.

56. **Static Fields.** Electrostatics, boundary value problems, dielectric material, magnetostatics, vector potentials. The calculation of capacitance and inductance for typical structures.

61. **Electromechanics I.** Magnetic circuits. Study of the commutating machine both in isolation and as a component in a d.c. control system. Terminal characteristics of the three modes of operation—generator, motor, and rotating amplifier; transient and steady-state analysis. Matrix methods are used extensively.
3 lectures, one term.

62. **Electromechanics II.** Two-winding and multi-winding transformers. Equivalent circuits are derived from transformation theory. Study of a.c. machines from their terminal characteristics. Symmetrical component sequence equations are derived from a linear transformation. Matrix methods are used extensively.
Prerequisite: EE 61.
3 lectures, one term.

63. **Electromechanics III.** Further study of a.c. machines. Derivation of forward and backward sequence components to enable steady state and transient analysis of synchronous and induction machines. Performance characteristics are derived analytically and experimentally.
Prerequisite: EE 62.
2 lectures, one term.

64. **Advanced Electromechanics.** Advanced topics in rotating machinery. Direct and quadrature component analysis of a.c. machines. Extensive treatment of nonlinear characteristics of synchronous machines in steady-state; equations suited for transient analysis on the digital computer are derived.
Prerequisite: EE 63.
3 lectures, one term.

65. **Power Systems Analysis.** Systematic mathematical formulation of systems of polyphase machines, 3-phase transformers, and transmission lines in terms of the sequence variables. Analytical and computer solutions.
Prerequisite: EE 63.
3 lectures, one term.

Prerequisite: Math 41, Phys 13.
3 lectures, one term.

Prerequisite: EE 71.
3 lectures, one term.
CURRICULA AND COURSES OF STUDY

Prerequisite: EE 42, EE 71.
2 lectures, one term.

Prerequisite: EE 72, Math 45.
3 lectures, one term.

75. Electric and Magnetic Materials. An introduction to the physical interpretation of the dielectric magnetic and conductive properties of materials; dielectric materials in static and alternating fields; atomic interpretation of magnetic properties; conductivity of metals; the mechanism of conduction in semiconductors; semiconductor rectifiers and transistors.
Prerequisite: ME 31.
3 hours, one term.

Prerequisite: EE 42, Math 45.
3 lectures, one term.

82. Control Systems II. Further study of feedback control systems. Design of control systems, examples taken from electrical and hydromechanical systems. Analogue computer simulation. Introduction to non-linear systems analysis, phase plane and describing function techniques. Introduction to statistical systems analysis, optimum system criteria.
Prerequisite: EE 81.
3 lectures, one term.

83. Communication Theory. Relation between information content of messages and system capacity; transmission through electric networks; modulation systems; periodic sampling, noise, comparative analysis of information transmission systems. The role of system bandwidth and noise in limiting the transmission of information is stressed.
Prerequisite: EE 52.
3 lectures, one term.

91. Electrical Laboratory I. An introduction to the theory and techniques of measuring instruments for electrical quantities, their uses and limitations, errors.
3 hours laboratory, alternate weeks, one term.

92. Electrical Laboratory II. A series of experiments and problems to accompany courses EE 41 and EE 51.
6 hours, one term.

93. Electrical Laboratory III. A series of experiments and problems to accompany courses EE 42, EE 52, EE 61, and EE 71.
6 hours, one term.

94. Electrical Laboratory IV. A series of experiments and problems to accompany courses EE 43, EE 53, EE 62, EE 72, and elective EE subjects, as appropriate.
6 hours, one term.

95. Electrical Laboratory V. A series of experiments and problems to accompany courses EE 63, EE 73, EE 81, and elective EE subjects, as appropriate.
4½ hours, one term.
96. Electrical Laboratory VI. A series of experiments and problems to accompany course EE 82 and elective EE subjects, as appropriate. 6 hours, one term.

99. Seminar. Each student is required to write a paper and present a short talk on some current engineering topic of his own choice. Additional talks or panel discussions may be arranged by the Department Chairman or by the students. one term.


607. Communications—Statistical Theory. Messages as time functions or time sequences; statistical properties of messages; linear systems; modulation and sampling theorems; noise. one term.

608. Communications—Information Theory. Properties of information; effect of noise on information transmission rate. one term.

613. Information Transmission. Messages as time functions or time sequences; statistical properties of messages; messages as stochastic processes; quantity of information; properties of the unit of information; message efficiency; coded efficiency and redundancy; continuous messages, modulation; relation between redundancy and modulation; effect of noise on information transmission rate; varieties and physical representation of noise; transition from impulse to thermal noise; Rice's noise theory, elementary prediction theory; apparent frequency of band-limited white noise; probability distribution of root-mean-square of independent samples of a Gaussian noise; maximum rate of transition of information; Shannon's transmission rate theory. one term.

one term.


one term.

622. **Introduction to Quantum Field Theory.** Review of quantum mechanic in Dirac Notation; review of relativity; relativistic quantum mechanics; Feynman theory of the positron; covariant formalism and invariant perturbation theory; quantization of free fields; S-matrix and divergence; renormalization theory; Schwinger's action principle in field theory; field theoretical methods for many-body problems in quantum mechanics.

one term.

623. **Quantum Electronics.** Quantum mechanical foundations; band theory; theories of Drude-Zener and Lorentz; interaction of radiation and matter; quantum tunnelling; infra-red absorption; electron spin resonance; masers and lasers.

one term.

699. **Thesis.**
ENGLISH

W. K. Thomas, M.A., Ph.D. (Toronto) - Professor and Chairman of the Department
J. W. McCutchan, A.B. (Davidson), A.M., Ph.D. (Virginia) - Professor
L. A. Cummings, A.B. (Washington), M.A. (Missouri), Ph.D. (Washington) - Assistant Professor
A. I. Dust, M.A., Ph.D. (Illinois) - Assistant Professor
W. R. Martin, M.A. (Natal) - Assistant Professor
J. S. Stone, M.A. (British Columbia) - Assistant Professor
J. Carscallen, B.A. (Toronto), B.Litt. (Oxon.) - Lecturer
Sister M. Leon, S.S.N.D., B.A. (Toronto), M.A. (Detroit) - Lecturer
A. M. MacQuarrie, R.A. (Acadia), M.A. (Toronto) - Lecturer
D. Keppel-Jones, B.A. (Natal) - Instructor

ENGLISH MAJOR IN GENERAL ARTS

In Year I the prospective English major should select English 100, Philosophy 100, Natural Science 100, at least one of French 100, German 100, and Latin 100, and other subjects in accord with the general regulations.

In Year II the English major shall complete English 200 and 250; in the course of Years II and III he shall complete one further Honours English course and at least two of English 210, 220, 225, 230, 330, 335, or any Honours English courses; in Year III he shall also complete English 345 and shall write a Comprehensive Examination in the general field of English Literature.

Subjects related to the study of English, and from which the English major is expected to choose his optional courses, are the following: Classics, French, German, History (especially English or American), Philosophy, Psychology, Religious Knowledge, Russian, Sociology and Spanish.

Note on numbering: English 100 and 200 are designed for both Honours and General students. Otherwise courses numbered 250-299, 350-399, and 450-499 are Honours courses, and all others are General courses.

Note on prerequisites: Normally English 100 (or its equivalent at another University) will be prerequisite to all courses numbered 200 and above (except 225 and 235). In addition English 200 (or its equivalent) will normally be prerequisite to English 380, 450, 455, 460 and 470.

5. Expository Writing. Designed for those Engineering students who enter the University from Grade 12, this course seeks to help them gain a reasonable command of written English, and so consists of the discussion of the English language, the reading of expository essays, and the frequent writing of such essays.

Texts: Braddock, Introductory Readings on the English Language; Morrison & Robbins, As A Man Thinks; Kazin, The Open Form; Sears, Harbrace Guide to the Library and the Research Paper.
3 lectures.
15. **English Literature.** Designed as an option for first-year Engineering students, this course seeks to further the understanding and appreciation of the various types of English literature and of the humanistic values to be found in it. Since such understanding cannot be separated from the clear and effective communication of the ideas concerned, students are required to write a number of essays on topics related to the literature studied.


3 lectures.

50J. **Preliminary Year English.** General literature and composition; the Ontario Grade 13 curriculum will be followed.

4 lectures.

100. **The Periods of English Literature, I: Mediaeval to Augustan.** Beginning with a training in critical reading and an introduction to the conventions of various literary types, this course then examines the principal characteristics of English Literature in the Middle Ages, the Renaissance, and the Augustan Age. (For both General and Honours students who are likely to take a further English course.)


3 lectures.

110. **Themes and Types of English Literature.** An examination of the humanistic content of English literature and the various forms in which it is expressed. (For students who are likely not to take a further English course.)


3 lectures.

130. **The Types of English Literature.** An examination of the humanistic content of English literature and the various forms in which it is expressed. (Primarily for science students.)


3 lectures.

200. **The Periods of English Literature, II: Romantic to Contemporary.** Completing the survey begun in English 100, this course examines English literature in the Romantic movement, the early and later Victorian period, and our contemporary period. (For both General and Honours students.)


3 lectures.

210. **The Novel.** A study, through selected authors, of the principal techniques and movements in the development of the English novel from its beginning to the present day.

**Texts:** To be announced.

3 lectures.
220. Drama from 1660. A study of the principal playwrights, plays and movements in dramatic history from the re-opening of the theatres in 1660 to the present day.
3 lectures.

Texts: To be arranged.
3 lectures.

230. Nineteenth-Century Literature. Designed to complement English 200, this course provides a more intensive study of Romantic and Victorian literature.
Texts: To be announced.

235. Selections from the Literature of Ideas. This course, which deals chiefly with the moral implications of scientific, political, social, and economic thought, is designed both to stimulate thought and to improve the student's ability to express himself in clear, organized fashion. Students are required to write essays and seminar papers on the topics discussed. (Primarily for Science students, but open to General Arts students.)
3 lectures.

250. Practical Criticism. A training in the application of critical principles to literary works. The course consists of a series of seminar meetings, for which the students prepare critical appraisals of literary works and in which these appraisals are examined and discussed in considerable detail.
1½ hour seminars.

260. Old English. An introduction to Anglo-Saxon language and literature in their historical context, with special attention to the development of the language.
2 lectures.

270. Middle English, with Special Emphasis on Chaucer. A study of Middle English literature, partly in translation and partly in the original, with special emphasis on the works of Chaucer, which will be read in the original.
3 lectures.

2 lectures.
CURRICULA AND COURSES OF STUDY

Texts: To be announced.
3 lectures.

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 MS as evidence of his ability to profit from the course.
3 lectures.

345. Supervision of Senior Essay.
1 hour a week.

2 lectures.

360. Drama to 1642. The rise of the drama and dramatic form; the work and influence of Shakespeare’s predecessors; the life and works of Shakespeare; the post-Shakespearian drama to the closing of the theatres.
3 lectures.

370. The Augustan Age. An historical and critical study, in seminars, of the drama, poetry, novels, and other writings of the age from Dryden to Johnson.
3 lectures.

380. The Romantic Movement. A critical study, in seminars, of the principles and practice of the Pre-Romantic and Romantic authors (poets, novelists, and essayists) from Gray to Keats.
Texts: Noyes, English Romantic Poetry & Prose; Byron, Don Juan, ed. Marchand; Goldsmith, The Vicar of Wakefield; Shorter Novels of the Eighteenth Century; Mackenzie, The Man of Feeling; Sterne, Tristram Shandy; Burney, Evelina; Lewis, The Monk; Austen, Emma; Scott, The Bride of Lammermoor.
3 lectures.

450. The Early Victorians, 1832-1880. An historical and critical study, in lectures and seminars, of the principal works of Tennyson, Browning, Arnold, Newman, Carlyle, Ruskin, Huxley, Pater, Trollope, Dickens, Thackeray, Eliot, and others of the early Victorian period.
Texts: To be announced.
2 lectures.
455. The Later Victorians, 1880-1914. An historical and critical study, in lectures and seminars, of the principal works of Hopkins, Housman, Hardy, Wilde, Synge, Shaw, Kipling, Bennett, and others of the later Victorian period.

Texts: To be announced.
2 lectures.

460. Twentieth-Century Literature. A critical study of the principal works of Shaw, Yeats, Eliot, James, Conrad, D. H. Lawrence, and others of the modern period.

Texts: To be announced.
3 lectures.

470. History of Literary Criticism. A study in seminars of the literary criticism of the four great ancients and of English writers from the Elizabethans to the present day.

Texts: Bate, Criticism: The Major Texts; Goldberg & Goldberg, The Modern Critical Spectrum; Patrides, Milton's "Lycidas": The Tradition and the Poem.
2 lectures.

475. English Linguistics. The principles of good English usage as approached through a discussion of modern linguistic theories. The first third of the course deals with historical and comparative linguistics, with particular application to the history and development of English; the latter two-thirds stress structural linguistics, with reference to English grammar. The class is limited to 20 students.

Texts: To be announced.
3 lectures.

495. Supervision of Senior Honours Essay.
1 hour a week.

Note: Upon securing the consent of the departmental chairman and the instructor concerned, Science and Engineering students may choose courses from those offered to Arts students.
GEOGRAPHY

R. R. Krueger, M.A. (Western), Ph.D. (Indiana)
Associate Professor and Chairman of the Department

A. Diem, B.A. (Wayne State), M.A. (Clark), Ph.D. (Michigan) - Assistant Professor

J. T. Horton, B.A. (Wheaton), M.A. (Northwestern) - Assistant Professor

E. R. Officer, B.A. (British Columbia), M.A. (Wisconsin) - Assistant Professor

15. Survey of Geography. This one term course presents a general review of the field of Geography, its scope, approach, and basic concepts. The primary aim is to provide the student with background, material, readings, sources and ideas against which major political developments, international economic relationships, and current problems of the commonwealth and underdeveloped areas may be viewed. Course topics include: the development and character of modern Geography; fundamentals of physiography; population patterns and problems; resources, economic growth and industrialization; the geographic bases of political patterns and events; and urban growth and land use planning.
3 lectures, half course.

100. Introductory Physical and Cultural Geography. This course is designed to introduce the student to the field of modern geography, its methods, concepts, materials and point of view. A major part of the course is devoted to a systematic examination of the elements of the natural environment, (including landforms, weather, and climate), and their distribution and significance in the human habitat. Selected aspects of economic and political geography are then considered, with an emphasis on world resources and the geographic bases of economic development, international trade, and political relationships. NOTE: Geography 100, or its equivalent, is normally a prerequisite for other courses in geography.
2 lectures, 2 hours laboratory.

2 lectures, 2 hours laboratory.

210. Geography of World Resources and Industries. An analysis of man's economic activity; the nature and occurrence of resources, problems of resource development and conservation; world distribution of primary production, and structure of world trade; major industrial regions and locational factors affecting representative industries.
2 lectures, 2 hour seminar.

220. World Regional Geography. A survey of the major natural and political regions of the world with attention to areas of current interest in world affairs; the interrelationships of physical, economic, and cultural factors, and their implications for problems of economic growth.
2 lectures, 2 hours seminar.

300. Geomorphology. Advanced study of the processes of geomorphology. Analysis of the development and distribution of landforms, with emphasis on pleistocene deposits. The relationships between landforms and natural vegetation, climate, soils, water resources, and man's economic activities.
2 lectures, 2 hours laboratory.
341. **Historical and Regional Geography of North America.** The economic and political geography of North America at different periods of time. The geographical influences of changing patterns of human occupancy. The historical-geographical approach to current economic and political problems.
3 lectures.

345. **Political Geography.** An examination of the geographic aspects of the world's political patterns; politico-territorial problems of states; contemporary international problems and their geographic backgrounds; geopolitics.
3 lectures.

350. **Urban Geography and Settlement Patterns.** A description and analysis of the geographic characteristics and relationships of urban centers, their origin, development, distribution, functions, internal structure, economic and political organization; industrial and commercial locational factors; the effects of transportation on settlement patterns.
2 lectures, 2 hours seminar.

355. **Geographic Approach to Land-Use Problems.** Urban and rural land-use problems; urban blight and redevelopment; problems of the rural-urban fringe; regional approach to land-use planning and resource management; conservation of renewable resources.
2 lectures, 2 hours seminar.

356. **Urban and Regional Planning — Landscape Design and Analysis.** Principles and fundamentals of design as they relate to urban and regional planning problems. Civic and landscape design; construction and layout of planning models; sketching, perspective, and projections.
3 lectures.

360. **Research and Field Methods.** Statistical data gathering and analysis; field analysis of landforms, soils, natural vegetation; urban and agricultural land-use mapping. One term of air photo interpretation.
4 hours field work, laboratory and seminars.

420. **Regional Geography of Canada.** The physical environment, resource base, settlement patterns, cultural characteristics, economic development and regional structure of the nation.
3 lectures.

421-429. **Geographic Analysis of Selected World Regions.** Detailed study of physical, cultural, economic and political geography; geographic basis of current problems.
3 lectures.

(N.B. One region only will be offered each year.)

421. Europe and the Mediterranean
422. Eastern Europe and the Soviet Union (offered in 1963-64)
423. Middle East.
424. Asia.
425. Oceania.
426. Africa.
427. Latin America.
428. United States of America.
429. Polar Lands.
CURRICULA AND COURSES OF STUDY

3 lectures.

456. Urban and Regional Planning — Political and Administrative Processes. Historical development of planning legislation in various parts of the world. Provincial and federal legislation affecting urban, regional and resource planning in Canada. Jurisdiction of provincial government bodies and agencies, municipal planning boards and councils; economic and political problems associated with the implementation of planning policies and decisions.
3 lectures.

460. Cartography. Cartographic principles, techniques, and basic mapping procedures; scales, map projections and design analysis or cartographic presentation drafting.
3 hours seminar and laboratory.

470. Area Studies Seminar.
1 - 2 hours seminar.

475. Special Readings and Seminar on Selected Topics.
1 - 3 hours seminar.

480. Geographic Thought and Methodology. Historical development of the discipline of geography contributions of German, French, British, and American geographers; current trends in the philosophy and methodology of geography.
2 hours seminar.

490. Senior Honours Essay or Research Project Related to Teaching.
2 - 3 hours seminar.
GERMAN AND RUSSIAN

J. W. Dyck, A.B. (Bethel), M.A. (Missouri), Ph.D. (Michigan)  
Professor and Chairman of the Department

E. Heier, M.A. (British Columbia), Ph.D. (Michigan)  
Assistant Professor

S. P. Hoefert, M.A. (Toronto)  
Assistant Professor

I. Levitsky, A.B. (Rochester), M.A. (Buffalo), Ph.D. (Duke University)  
Assistant Professor

GERMAN

Notes: (1) All courses are designed to acquaint the student with the thoughts, feelings, and ideas that have been expressed in German, Austrian, and Swiss literature. Particular consideration is given to critical analysis of literary texts and their contribution to European thought and to the whole of civilization.

The programmes for German major and Honours students are intended to give a coherent and complete picture of German literature.

(2) All courses above 100 are honours courses. Those marked with an asterisk are particularly recommended for general students.

(3) German 270 meets the requirement otherwise referred to in the calendar as cultural or civilization course.

1. Beginner's German. For Engineering students with no previous knowledge of German. The elements of German grammar, reading and translation.
   3 lectures.

1-50. Beginner's German. For Arts and Science students with no previous knowledge of German. The elements of German grammar, reading, oral practice, composition.
   Arts - 5 lectures, Science - 3 lectures.

15. Scientific German. A review of the fundamentals of grammar is followed by a more advanced study of grammatical 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. (For Engineering students. Can be taken together with German 50 for Science students.)
   Prerequisite: German I or equivalent.
   3 lectures.

50. Scientific German. A review of the fundamentals of grammar is followed by a more advanced study of grammatical 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. (For Science students. Can be taken jointly with German 15 for Engineering students.)
   Prerequisite: German I or equivalent.
   3 lectures.

100. Introduction to German Literary Movements. Reading and interpretation of representative works of major German authors from the beginning to the present. Oral practice, composition, grammar. This course is conducted primarily in German.
   Prerequisite: Grade 13 German or equivalent. First Class Honours in Grade 12 or permission of the Department Chairman.
   3 lectures.
CURRICULA AND COURSES OF STUDY

250.* Conversation, Composition, Grammar and Phonetics. This course is conducted in German and provides intensive practice in spoken German. Vocabulary building, comprehension, pronunciation and intonation are stressed. Prerequisite: German 100, first class honours in Grade 13 or permission of the Department Chairman. 3 lectures.

260.* The Age of Goethe. Storm and Stress, The Classical Period, Romanticism. Reading, interpretation and critical analysis of representative works of Lenz, Klinger, Goethe, Schiller, Kleist, Novalis, Brentano, Eichendorff, etc. Prerequisite: German 100. 3 lectures.

270.* German Cultural Periods. A study of the major thought movements and masterpieces of philosophy, literature, music, art, etc. This course is taught in English. 3 lectures.

350.* Intermediate Conversation and Composition. Written reports on prescribed themes and topics. Oral drill. Prerequisite: German 250 or equivalent. 1 lecture.

360.* German Realism. Reading, interpretation, and critical analysis of prescribed prose, drama and poetry. (Fontane, Hebbel, Keller, Storm, etc.) Prerequisite: German 100 or equivalent. 3 lectures.

370. Introduction to the History of the German Language with Readings in Middle-High German Literature. (Walther von der Vogelweide, Hartmann, Wolfram, Gottfried, etc.) Prerequisite: German 100 or equivalent. 3 lectures.

380.* Baroque/Enlightenment. Reading, interpretation and critical analysis of prescribed prose, drama, and poetry. (Grimmelshausen, Gryphius, Gellert, Lessing, Wieland, etc.) Prerequisite: German 100 or equivalent. 3 lectures.

450. Advanced Conversation, Grammar and Composition. This course is conducted in German and provides intensive practice in spoken German on the advanced level. Prerequisite: German 350 or equivalent. 1 lecture.

460. Modern German Literature. Reading and interpretation of prescribed works. (Hauptmann, Hoffmannsthal, Rilke, Kafka, Mann, Brecht, etc.) Prerequisite: German 100 or equivalent. 3 lectures.

470. German Poetry. A study of the main thoughts, themes, forms and schools in German poetry throughout the ages. Texts: The Oxford Book of German Verse, Echtermeyer-von Wiese. Prerequisite: German 100 or equivalent. 3 lectures.

600. German Literary Criticism. This course is designed to meet the need of individual honours or graduate students. The detailed study of an author, a period, genre, or literary problem, as well as literary theories, may be included in the course.
650. Goethe. A comprehensive study of the man and his works, one term.

651. Kleist. A comprehensive study of the man and his works, one term.

660. Seminar. A critical analysis of the major works of Kleist, Holderlin, and Jean Paul with special emphasis on literary theories and philosophical movements which influenced their lives and writings.

670. Lessing. A comprehensive study of the man and his works, one term.

671. Schiller. A comprehensive study of the man and his works, one term.


RUSSIAN

Notes: (1) All courses above 100 are honours courses. Those marked with an asterisk are particularly recommended for general students.

(2) Russian 270 meets the requirement otherwise referred to in the calendar as cultural or civilization course.

1. Beginner's Russian. For Engineering students with no previous knowledge of Russian. The elements of Russian grammar, reading and translation. 3 lectures.

1-50. Beginner's Russian. For Arts and Science students with no previous knowledge in Russian. The elements of Russian grammar, reading, oral practice, composition. Arts 5 lectures, Science, 3 hours.

15. Scientific Russian. A review of the fundamentals of grammar is followed by a more advanced study of grammatical structure and idiom. Readings and translation from contemporary scientific writings 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. (For Engineering students—can be taken together with Russian 50 for Science students.) Prerequisite: Russian 1 or equivalent. 3 lectures.

25. Russian Thought and Culture. (taught in English) This course is divided into two parts. Part I deals with the chronological development of art, literature, social, political and religious aspects during the time of Imperial Russia. Emphasis will be placed on the Byzantine influence and Mongol domination which caused the eventual isolation of Russia from Western Culture. Special lectures are devoted to the "Westernization" of Russia under Peter the Great and Catherine II, the coming of the Slavophiles and the Russian Intelligentsia, a thorough discussion of social and political conditions, literary and philosophical contributions of the 19th century which ultimately led to the overthrow of the Czarist regime. Part II is entirely devoted to the Soviet Union—cultural, political, nationality problems, the establishment of new social institutions, education, Soviet philosophic thoughts and scientific achievements are discussed in detail. 3 lectures.
CURRICULA AND COURSES OF STUDY

50. Scientific Russian. This course aims to make it possible for students of the Physical Sciences to read scientific writing. Emphasis will be placed on translation and reading skill. The fundamental principles of Russian grammar will be reviewed. (For Science students—can be taken jointly with Russian 15 for Engineering students.) Prerequisite: Russian I or equivalent. 3 lectures.

100. Introduction to Russian Literary Movements. Reading and interpretation of representative works of major Russian authors from Pushkin to the present. Oral practice, composition, grammar. Prerequisite: Grade 13, Russian 1-50 or equivalent. 3 lectures.

250.* Introductory Russian Conversation, Composition and Phonetics. Review of grammar, presentation of oral and written reports. Prerequisite: Russian 100, first class honours in Grade 13 or equivalent. 3 lectures.

260.* The Golden Age of Russian Literature. (Krylov, Zhukovsky, Pushkin, Lermontov, etc.) Reading, interpretation and critical analysis of prescribed prose, drama, and poetry. Prerequisite: Russian 100. 3 lectures.

270.* Russian Thought and Culture. A study of the major thought movements and masterpieces of philosophy, literature, history, music, art, etc. The second half of the course will place emphasis on developments during the last forty years. This course is taught in English. 3 lectures.

350.* Intermediate Conversation and Composition. Written reports on prescribed themes and topics. Oral drill. Prerequisite: Russian 250 or equivalent. 2 lectures.

360.* Russian Realism. (Gogol, Turgenev, Tolstoy, Dostoyevsky, Chekhov, Gorki, etc.) Reading, interpretation and critical analysis of prescribed prose, drama and poetry. Prerequisite: Russian 100. 3 lectures.

370. Russian Literature from its Beginning to the 18th Century. An introduction to the History of the Language. Study of the Epics and Byliny. Readings and interpretations of representative works of Lomonosov, Derzhavin, Fonvizin, Radishchev. Prerequisite: Russian 100. 3 lectures.

380. The Peoples of the Soviet Union. Especially emphasized will be the influence of the non-Slav peoples (the Uralic, Mongol, Caucasian, etc.) on Russian race and culture. 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. 3 lectures.
390. **The Image of Russia and the Russians in Western Thought and Writings.**
This is a critical appraisal of the changing image of the Russian and Russia as presented by West European writers, poets and thinkers. Consideration will also be given to the image of western man in Russian literature.
3 lectures.

450. **Advanced Conversation, Composition, Grammar and Phonetics.** This course is conducted in Russian and provides intensive practice in spoken Russian on the advanced level.
Prerequisite: Russian 350 or equivalent.
2 lectures.

460. **Soviet Literature.** (Essenin, Mayakovsky, Babel, Fedin, Pasternak, Sholokhov etc.) Reading, interpretation and critical analysis of prescribed prose, drama, and poetry.
Prerequisite: Russian 100.
3 lectures.

470. **Russian Literature in Translation.** Major works by Pushkin, Gogol, Turgenev, Tolstoy, Dostoyevsky, Chekhov, and Gorki.
Prerequisite: At least one course in any other literature.
3 lectures.

480. **Russian Poetry Throughout the Ages.** A study of themes, forms and schools.
(Pushkin, Lermontov, Essenin, Mayakovsky, Pasternak, etc.)
Prerequisite: Russian 100.
2 lectures.
HISTORY

P. G. Cornell, M.A., Ph.D. (Toronto) E.D., Professor and Chairman of the Department

K. A. MacKirdy, M.A. (British Columbia), Ph.D. (Toronto), Professor

A. W. Rees, B.A. (Aberystwyth University College), M.A. (Wales), Professor R

J. L. Arnold, C.R., M.A. (Western), Associate Professor

R. E. Wynne, D.Jur. (Vienna), B.Ed., M.A. (Alberta), Assistant Professor

E. P. Patterson, B.A. (Baylor), M.A. (Kansas), Ph.D. (Washington), Assistant Professor

R. C. MacGillivray, B.A. (Queen's), A.M. (Harvard), Lecturer

Y.-F. Zoltvany, B.A. (Loyola), M.A. (Montreal), Lecturer

Any student who has fulfilled the general requirements for admission to the first year in Arts, is qualified for admission to both the General Course and Honours Course in History. Where a student has an opportunity to choose matriculation subjects in preparation for university work in history he should emphasize English, Languages, Geography, and History.

5. An Historical Introduction to the Ideas and Concepts of a Selected Field of History.
3 lectures.

15. An Historical Introduction to the Ideas of Western Civilization.
2 lectures, 1 hour laboratory,
Other history courses may be elected by Engineering students in senior years in consultation with the Department.

50J. Preliminary Year History. The Ontario Grade 13 curriculum will be followed.
3 lectures.

100. An Historical Introduction to the Ideas of Western Civilization. Designed especially for freshmen.
2 lectures, 1 hour discussion groups.

200. The Expansion of Europe Since 1400 A.D. Surveys the course of Portuguese, Spanish, Dutch, and French colonial expansion, as compared to the historical development of British overseas institutions (1400 - to 20th Century).
3 lectures.

3 lectures.

250. History of Mediaeval England and Europe 300-1300 A.D.*
3 hours seminar.
255. Greek and Roman History.* A survey of the social, political, and economic history of Greece and Rome with a brief introduction to the civilizations of the Ancient Near East.
3 lectures.

3 hours seminar.

3 hours seminar.

275. Russian History. The origins and development of Czarist Russia; Russian History since 1917*. (Not offered in 1963-64).
3 hours seminar.

276. Germany 1648 - 1914. A survey of the society, economy, and political problems of Central Europe from the Thirty Years' War to the First World War, with particular emphasis on the nineteenth century.
3 hours seminar.

3 hours seminar.

280. History of French Canada.*
3 hours seminar.

285. Latin American History. The discoveries, the Spanish imperial system, revolution, selective studies of typical national development, panamericanism.* (Not offered in 1963-64).
3 hours seminar.

3 hours seminar.

299. Supervised Reading in Non-English Texts and Periodicals. The foreign language will be chosen in consultation with the Department.
1 hour seminar.

300. Canadian and American History Since 1760. A general survey of Canadian history with the introduction of several themes from American history that have a bearing on Canadian development.
3 lectures.

3 lectures.

349. Senior Essay.
1 hour seminar.

350. European History from 1789 to the Present*. A reassessment of a period once interpreted in the optimistic language of the eighteenth century Enlightenment, with a view to understanding the wars, revolutions, and ideologies of the twentieth century.
3 lectures.

360. Modern British History Since 1485*.
3 hours seminar.
370. Comparative Studies in Imperialism and Colonization*. The development of British colonial policy and the adjustment of British settlers to their new environment, compared with the policies and experiences of other European peoples. Different themes will be developed each year. In 1963-64: India and Indonesia; Canada and Siberia.
3 hours seminar.

380. Canadian History, Chiefly Since 1760*.
3 hours seminar.

450. History of the United States*. The growth of a new nation; the territorial and economic expansion of the United States from the Revolution to the Second World War; interrelationship of economic, social, political, and intellectual developments.
3 lectures.

460. History of the Far East in the Nineteenth and Twentieth Centuries.
3 hours seminar.

462. Modern Diplomatic History. (Not offered in 1963-64).
3 hours seminar.

3 hours seminar.

470-479. Tutorials for Senior Students in Special Historical Subjects.
2 hours seminar.

480. Interdisciplinary Seminars. (To be made available to selected senior students, by the co-operation of several Arts Departments.)
2 hours seminar.

499. Senior Honours Essay.
1 hour seminar.

Note: The graduate work offered by the Department of History is confined to the areas of the subject where adequate resources of source material are available.

The Master of Arts in History will require three graduate courses and a thesis, together with a reading knowledge of one foreign language appropriate to the candidate's major field. One appropriate course may be undertaken from a discipline other than History.

600. Historiography and the History of Historical Writing. A systematic examination of the nature of historical work, and the major philosophical and technical problems of research and writing in the field. A review of the major traditions and works in history from the time of Herodotus.
half course.

Field Courses: (Designed to introduce the student to the sources and the best secondary works in the field of history.) (610-620).

610. Canadian History.
half course.

615. Colonial and Imperial History.
half course.

620. Modern Europe.
half course.

650. Seminar in Major Field. The preparation, presentation, and discussion of research papers based upon available sources.
half course.


*Courses which are especially valuable to students who propose to teach history in Secondary Schools.


8. **Mathematics Problems.** A problems course to accompany courses 6, 7, and 11. Students will work selected problems under supervision. A certain proportion of the problems will extend the work of courses 6, 7, and 11 to include mathematical formulation of physical problems. 4 hours problems.

12. **Calculus I.** Functions and limits, the derivative. Differentiation formulae. Applications to tangents, rates, extrema. The indefinite and definite integrals, fundamental theorem of integral calculus. Applications to area, volume, centroids, moments of inertia, fluid pressure, work, potential. Introduction to the trigonometric, inverse trigonometric, exponential, logarithmic functions. Transcendental functions. Parametric and polar equations. Formal integration and applications to physical problems. Students will work selected problems under supervision. A certain proportion of the problems will include mathematical formulation of physical problems. 3 lectures, 2 hours problems.


22. **Calculus II.** A continuation of course 12. Infinite series and power series. Partial derivatives. Multiple integration and applications to areas, volumes, centroids, moments. Introduction to differential equations. Prerequisite: Math 12. 3 lectures, one term.

23. **Numerical Methods.** Introduction to the use of desk calculators. Simple problems on interpolation, solution of algebraic equations, numerical evaluation of integrals, systems of equations. 2 hours problems, one term.

24. **Mathematics Problems.** A problems course to accompany Math 22. 2 hours problems, one term.


33. **Differential Calculus.** Real numbers, sequences, limits, continuity. The derivative. General Theorem of Mean Value. Functions of several variables, implicit functions, Jacobians. Power series with complex terms, the Taylor series for functions of several variables, constrained extrema. The elementary functions for a complex variable. Prerequisites: Math 22, 31. 3 lectures, one term.
Prerequisites: Math 22, 31.
3 lectures, one term.

Prerequisites: Math 22, 31.
2 lectures, one term.

Prerequisites: Math 22, 31, and consent of instructor.
2 lectures, 1 hour problems, one term.

44. Complex Variable. Cauchy-Riemann equations, the Cauchy integral theorems, conformal mapping, the Taylor and Laurent series, contour integration.
Prerequisites: Math 33, 34.
2 lectures, 1 hour problems, one term.

45. Applied Analysis II. Further study in the topics listed for Mathematics 41.
Prerequisite: Math 41.
3 lectures, one term.

Prerequisite: Math 22.
2 lectures, 3 hours problems, one term.

Prerequisites: Math 22, 31, and consent of instructor.
2 lectures, 1 hour problems, one term.

Prerequisites: Math 22, 31, and consent of instructor.
2 lectures, 1 hour problems, one term.

Prerequisite: Math 32.
3 lectures, one term.

Prerequisite: Math 21.
3 lectures, one term.

60J. Preliminary Year Algebra. The Ontario Grade 13 curriculum will be followed.
3 lectures.
621. Preliminary Year Geometry. The Ontario Grade 13 curriculum will be followed.
3 lectures.

681. Preliminary Year Trigonometry. The Ontario Grade 13 curriculum will be followed, omitting the study of Statics.
3 lectures.

3 lectures.

2 lectures, 1 hour problems.

1 lecture, 2 hours problems.

3 lectures.

2 lectures.

3 lectures.

1 lecture, 2 hours problems.

2 lectures.

2 lectures.

2 lectures.

3 lectures.

331. Algebra II. A continuation of course 230,
2 lectures.

3 lectures.

2 lectures.

2 lectures, 2 hours laboratory.

335. Finite Differences. A theoretical course in the calculus of finite differences to include summation, the differences of zero, numerical integration, the relation between integration and summation. An introduction to difference equations.
2 lectures.

336. Life Contingencies. An advanced course on problems of single lives.
2 lectures.

2 lectures.

2 lectures.

2 lectures.

2 lectures.

431. Algebra III. A continuation of course 331.
2 lectures.

2 lectures.


435. **Laboratory.** Numerical problems arising in actuarial science and statistics. 2 hours laboratory.

436. **Life Contingencies II.** An advanced course on the death and survival of multiple lives. 2 lectures.

437. **Graduation and Mortality.** Methods of constructing and graduating mortality tables. 1 lecture.

438. **Estimation and Hypothesis Testing.** The mathematics and logic of estimation and hypothesis testing. Information. Consistency. Efficiency. Sufficiency. Fiducial and confidence intervals. The problems of large and small samples. 2 lectures.


440. **Advanced Probability.** Recurrent events. Markov processes and applications to Physics and Biology, including diffusion processes and epidemics. 2 lectures.

441. **Quantum Theory.** The classical mechanics of Lagrange and Hamilton. Introduction to quantum theory. 2 lectures.

442. **Theory of Relativity.** Covariant and contravariant tensors. Riemannian space, Gaussian curvature. The Lorentz transformation and Einstein's special theory. Introduction to the general theory of relativity. 2 lectures.

443. **Electromagnetism II.** Applications of the Maxwell equations. Reflection and refraction. Introduction to wave guides and antennae. 2 lectures.


446. **History of Mathematics.** The development of Mathematics from ancient to modern times, including study of prominent mathematicians and their works. Problems will be worked using both modern and historical approaches. 2 lectures.

447. **Statistical Mechanics.** Applications of probability theory to theoretical Physics. 2 lectures.


604. **Special Functions.** Elliptic functions. The hypergeometric function. The gamma and beta functions. The functions of Laplace, Legendre, Lamé, Mathieu, and Bessel. Orthogonal functions; the functions of Laguerre, Hermite, Chebyshev.

605. **Groups and Matrices.**

611. **Advanced Probability.** Review of classical probability theory, including occupancy problems, the binomial, Poisson, and normal distributions, applications in physics. Recurrent events. Markov chains, stochastic processes, including the ruin problem and diffusion processes; application to information theory, radar, queuing problems, etc.

614. **Integral Equations.**

615. **Group Characteristics and Representation Theory.**


624. Advanced Statistics.

625. Galois Theory.


634. Topics in Ordinary Differential Equations.

635. Algebraic Numbers.

639. Functional Equations.

641. Mathematical Methods of Operations Research. Review of the mathematics used in model making. Methods of optimization, including linear programming and game theory. Applications to business, industrial, and military problems, including inventory replacement and allocation models, queuing theory, and decision theory.

645. Rings and Ideals.

649. Functional Analysis.


655. Combinatorial Analysis.


675. Linear Graphs. Definitions and basic theorems. Planar graphs and Kuratowski’s Theorem. Selected topics from advanced graph theory.

688. Special Topics in Algebra.

698. Special Topics in Analysis.
MECHANICAL ENGINEERING

W. B. Fallis, M.A.Sc., Ph.D. (Toronto)

Professor and Acting Chairman of the Department

S. A. Alpay, Dipl.Ing., Dr.Ing. (Berlin) - - - - - Professor
J. W. Church, B.Sc. (Queen's), M.A.Sc. (Toronto) - Sessional Associate Professor
A. A. Bruneau, B.A.Sc. (Toronto), D.I.C., Ph.D. (London) - Assistant Professor
T. A. Brzustowski, B.A.Sc. (Toronto), A.M. (Princeton) - Assistant Professor
R. M. Davies, B.A.Sc. (Toronto), M.Sc. (Stanford) - Assistant Professor (on leave of absence)
A. R. LeFeuvre, M.A.Sc. (Toronto) - Assistant Professor (on leave of absence)
G. D. McPherson, B.A.Sc. (Toronto), M.Sc. (Ottawa), Ingenieur en Genie Atomique (Institut National des Sciences et Techniques Nucleaires, Saclay) - Assistant Professor (on leave of absence)

W. B. Nicoll, S.M. (Massachusetts Institute of Technology) Engineer (Stanford) - Assistant Professor (on leave of absence)
G. F. Pearce, B.A.Sc. (British Columbia), M.A.Sc. (Toronto) - Assistant Professor
K. R. Piekarski, Dipl. Ing. (London) - - - - - Assistant Professor
G. N. Soulis, B.A.Sc. (Toronto) - - - - - Assistant Professor
G. K. Fleming, B.Eng. (Nova Scotia Technical College), M.A.Sc. (British Columbia) - Lecturer

11. Dynamics. An extension of the physics course in Mechanics with particular reference to engineering situations and problems for Civil and Electrical Engineering students. The vector treatment of dynamics is used. Relative motion, integration of Newton's Law for rectilinear translation, energy methods, methods of momentum. 2 lectures, one term.


13. Kinematics. A basic course in kinematics emphasizing the creative approach. Uniform rotary motion including rolling cylinders, gears and the synthesis of gear trains including planetaries. Non-uniform motion including cams, gears and linkages. Programming non-uniform motion and the synthesis of cam mechanisms, non-circular gear trains and linkages. 2 lectures, 2 hours laboratory, one term.

21. Mechanics of Machinery. The effects of dynamic forces in machines. Introduction to mechanical vibrations. Transient forces. Static force analysis, dynamic force analysis, balancing, cam dynamics, dynamics of feedback systems. Prerequisites: ME 13. 2 lectures, 3 hours laboratory, one term.
22. **Design of Machines.** Theory and application of mechanics of solids to machine parts. Design of machine elements; power screws, shafting, bearings, belts, gears, flywheels, clutches and brakes, crankshafts, springs, thin and thick wall pressure vessels, lubrication, ball and roller bearings. 
Prerequisites: ME 21. 
3 lectures, 3 hours laboratory, one term.

23. **Analysis and Synthesis of Machines.** Principle of optimum design, optimizing for minimum cost, maximum power capability, minimum weight, effects of manufacturing errors on product performance, statistical consideration for the factor of safety, optimum design of machine elements; torsion shafts, beams, gears, etc. Castigliano's theorem, fluctuating loads, impact forces, axially symmetric stress conditions. Bearing design. 
Prerequisites: ME 22. 
3 lectures, one term.

Prerequisites: ME 21. 
3 lectures, one term.

3 lectures, 3 hours laboratory, one term.

Prerequisites: Phys. 15 
2 lectures, 3 hours laboratory, one term.

Prerequisites: ME 32. 
2 lectures, 3 hours laboratory, one term.

Prerequisites: ME 33. 
3 lectures, one term.

35. **Nuclear Engineering.** An introductory course in nuclear reactor theory and design, isotope applications and fusion. Topics covered will include fission and the chain reaction, reactor principles, reactor components and materials, heat transfer, reactor design, uses of isotopes, applications of nuclear power and the fusion process. 
Prerequisites: Math 31, Phys 15. 
3 lectures, one term.

Prerequisites: Chem. 11, Phys 15. 
3 lectures, one term.
37. **Ceramics.** The crystallography of ionic and co-valent compounds. A study of the mechanical properties of single crystals and polycrystals. Properties of special ceramic materials.
   Prerequisite: Chem 11, Phys 15.
   3 lectures, one term.

41. **Manufacturing Analysis.** Analysis of industry as a communication system, production system and financial system. Work flow as related to physical facilities, plant layout, and product design. Basic manufacturing processes as related to statistical matching of physical properties of materials and performance characteristics of machinery.
   3 lectures, one term.

42. **Industrial Organization.** Principles and forms of organization, industrial functions and types of industry. Industrial economic studies and controls. Information gathering and information analysis, decision making and information dissemination. Production inventory, quality, cost, and budgetary controls.
   Prerequisites: ME 41, Math 51.
   3 lectures, one term.

51. **Thermodynamics.** Primarily intended for electrical engineering students, this course is an introduction to thermodynamics and heat transfer. Topics covered include: concepts of property, state, equilibrium, heat, and work; equations of state; zeroth, first, and second laws; entropy; conduction, convection, and radiation heat transfer. Applications to selected thermodynamic systems of interest to electrical engineers.
   3 lectures, one term.

   Prerequisites: Math 22.
   3 lectures, 3 hours laboratory, one term.

   Prerequisites: ME 52, Math 31.
   3 lectures, 3 hours laboratory, one term.

54. **Thermodynamics II.** Review of the basic concepts and postulates of thermodynamics and the conditions for equilibrium. Reactive systems. An introduction to irreversible thermodynamics. Applications to selected engineering systems including direct conversion devices, gas turbines. Advanced topics in heat transfer.
   Prerequisites: ME 52.
   3 lectures, one term.

   Prerequisites: Math 55.
   3 lectures, one term.
Prerequisite: ME 53.
3 lectures, one term.

Prerequisites: ME 12, Math 31.
3 lectures, 3 hours laboratory, one term.

Prerequisites: ME 61, Math 44.
3 lectures, one term.

Prerequisites: ME 61.
3 lectures, one term.

Prerequisites: ME 61.
3 lectures, one term.

Prerequisites: ME 53, ME 61.
3 lectures, one term.

71. Fundamentals of Design. Principles of information gathering, analysis, hypothesis creation, hypothesis testing, and solution communication. Discussions of design as environmentally controlled man-machine systems. Discussion of the relationships between the technical and non-technical aspects of design. Exercises and applications of the above concepts. 
1 lecture, 2 hours laboratory, one term.

Prerequisites: ME 71.
3 lectures, 2 hours laboratory, one term.
81. Seminar. Designed to give the student personal experience in oral presentation of technical information. Also provides an opportunity for students to attend seminars on topics of interest presented by recognized workers in the field. 1 hour, one term.

82. Mechanical Engineering Projects. Engineering assignments requiring the student to demonstrate initiative and assume responsibility. Student activity is guided and co-ordinated by faculty supervisors. In selecting and assigning projects, particular account is taken of the student's field of specialization. Projects, in general, involve technical disciplines beyond the strictly mechanical engineering field. 9 hours laboratory, one term.


602. Fluid Machinery II. Thermodynamics and fluid mechanics for flow phenomena in steam and gas turbines, air compressors, and jet propulsion devices. Operating characteristics of fluid machinery involving compressible flow. Selected problems of mechanical strength and vibrations encountered in rotating machinery and blading. one term.


one term.


one term.


one term.


one term.


one term.


one term.


one term.


one term.


one term.

698. Special Directed Studies.

one term.
PHILOSOPHY

R. J. C. Burgener, M.A., Ph.D. (Toronto)
Associate Professor and Acting Chairman of the Department

C. A. Hergott, C.R., M.A. (St. Louis), S.T.D. (Gregorian) - - Professor J

Associate Professor

L. Armour, B.A. (British Columbia), Ph.D. (London)
Assistant Professor

P. Seligman, B.A., Ph.D. (London) - - - - Assistant Professor

P. B. Sheridan, C.R., M.A. (Western), J.C.D. (Gregorian), Ph.D. (Fribourg)
Assistant Professor J

C. C. Brodeur, M.A. (Fordham), M.A. (Toronto) - - - - Lecturer

J. R. Horne, M.A. (Western), B.Th. (Huron) - - - - Lecturer R

100. Introduction to Philosophy. The normal first course in philosophy both for those intending to proceed further and for those desiring a single terminal course. The student will attempt to come to grips with some of the fundamental problems of human life, for example, those associated with the nature of matter, mind, reality, knowledge, religion, virtue and beauty. Philosophies both ancient and modern will be discussed and some time devoted to the consideration of the formal structure of inference (logic) as it occurs in science and other instances of reasoning, argument, proof, and persuasion. 3 hours.

100J. Introduction to Philosophy. A study of St. Thomas and his writings; fundamental Thomistic principles. 3 hours.

140J. Logic and Epistemology. Nature and division of philosophy; nature of logic, the term; the proposition; argumentation; induction and deduction; scientific demonstration. Truth; certitude; evidence; sense and intellectual knowledge; criterion of truth; contemporary theories. 3 hours.

200a. History of Philosophy I. A preliminary examination of the philosophy of Plato. Mention will be made of the historical Socrates and some of the Presocratics. Prerequisite: Philosophy 100. 3 hours, half course.

200b. History of Philosophy III. A preliminary account of early modern philosophies, with emphasis on the views of Descartes, Locke, Malebranche, Leibnitz, Spinoza, Berkeley, Hume. Prerequisite: Philosophy 100. 3 hours, half course.

200J. Cosmology and Philosophy of Science. Corporal bodies and change; quantitative and qualitative characteristics; motion; time, space; hylomorphic theory. Nature of science; abstraction; necessity; foundation and object of science; scientific method; hypothesis and theory. 3 hours.
210a. History of Philosophy II. A preliminary examination of the philosophy of Aristotle, particularly with reference to his Metaphysics, Physics and Psychology, a preliminary examination of Mediaeval philosophy. Prerequisite: Philosophy 100. 3 hours, half course.

210b. Moral Philosophy. The various alternative ways of dealing theoretically with questions about human moral value. Some of the views of the following positions will be discussed: the Epicureans, the Stoics, Socrates, Plato, Aristotle, Christianity, Spinoza, the Utilitarians, Nietzsche, Schopenhauer, Shaftesbury. Emphasis will be placed on relating these various views to the ethical pronouncements of the modern social sciences particularly cultural anthropology, behaviourism and Freud. Prerequisite: Philosophy 100. 3 hours, half course.

220. Logic, Introductory and Intermediate. Various systems of deductive logic. Inductive logic and scientific method. As compared to the elementary logic, contained in Philosophy 100 the treatment here will be more extensive and lay greater emphasis on the attaining of technical facility. This course may be taken without Philosophy 100 as a prerequisite but may be taken subsequent to Philosophy 100 without fear of redundancy. 3 hours.

240J. Ethics. End of Man; the human act; law, conscience; morality; rights and duties; duties of man as an individual and as a member of society. 3 hours.

250. Tutorial for Honours. 1 hour.

300a. History of Philosophy IV. The Philosophy of Kant. Emphasis will be placed on the Prolegomena, some sections of the Critique of Pure Reason. Prerequisite: Philosophy 200. 3 hours, half course.

300b. History of Philosophy V. From Hegel to the Present. The course will include a survey of 19th and 20th century idealism, pragmatism, and modern empiricist, analyst, linguistic and positivist schools including such philosophers as Bertrand Russell, A. J. Ayer, H. H. Price, and Wittgenstein. Prerequisite: Philosophy 300a. 3 hours, half course.

300J. Metaphysics and Natural Theology. The notion and analogy of being; the primary principles of being; the properties, division, and causes of being. Demonstration of existence of God; His nature and attributes; the divine intelligence and will; creation and providence. 3 hours.

310. Twentieth Century Moral and Theological Views. A sequel to the course on Moral Philosophy in which similar topics are dealt with in the form in which they have appeared in contemporary writing and discussions. Prerequisite: Philosophy 210. 2 hours.

315. Political Philosophy. Philosophical analysis of central concepts in political theory. The effect of the central issues of moral philosophy, epistemology, and metaphysics on the formation of political theories. Examples will be drawn from the work of philosophers of a number of periods and schools—for example, Plato, Aristotle, St. Thomas Aquinas, Hobbes, Locke, Hegel, Marx and contemporary thinkers. Prerequisite: Philosophy 100. 2 hours.
320. Introduction to Aesthetics. The philosophical consideration of art and beauty. A study of the basic problems with examples from historical and contemporary writers. Various theories of art criticism and literary criticism. Art related to society, morality, the sciences and religion. Prerequisite: Philosophy 100. 2 hours.

330a. Oriental Philosophy. A survey of non-western philosophy, particularly that of China, Japan, and India. The views of such philosophers as Confucius, Lao-Tze and Mencius will be discussed and the philosophical content of the early Hindu and Buddhist writings examined. Zen Buddhism and other modern views. Prerequisite: Philosophy 100. 2 hours, half course.

330b. Philosophy of History. Consideration of the various possible views about the ultimate nature and significance of history and historical knowledge. Such views as the following are examined: St. Augustine, Vico, Hegel, Marx, Spengler, Croce, Collingwood and Toynbee. Prerequisite: Philosophy 100. 2 hours, half course.

340. Interdisciplinary Seminar. Specific problems regarding the philosophical underpinnings of various sciences and disciplines, including Physics, Biology, Mathematics, Psychology, History, Political Science and Economics, English and other literatures. Conducted by one philosophy instructor in conjunction with one other "visiting" instructor from the discipline concerned. Normal period for each discipline will be two weeks. Prerequisite: Two full courses in Philosophy. 2 hours.

340J. History of Philosophy. A survey of Philosophy from Presocratics to contemporary philosophers. 3 hours.

348J. Seminar in Philosophy. A special study of the principal philosophers of the modern and contemporary eras. 3 hours.

349. Senior Essay. For Philosophy majors in the pass course. 1 hour.

450. Epistemology. The basic problems in the theory of knowledge, the nature of logical inference, concepts, causal and rational necessity, determinism, freedom, meaning, language, the fundamental nature of communication. Prerequisite: Philosophy 300a. 2 hours.

451. The Central Problems in Aesthetics. The relation of the phenomena peculiar to aesthetic experience to cognitive grounds. The ontological and epistemological status of the passions and the individual quale of a work of art. Prerequisite: Philosophy 300a, 320. 2 hours.

453. Mediaeval Philosophy. Detailed consideration of selected portions of the works of St. Thomas and other mediaeval philosophers such as Occam, St. Anselm, Albertus Magnus, St. Bernard, Duns Scotus. Prerequisite: Philosophy 200a. 2 hours.
CURRICULA AND COURSES OF STUDY

452. **Ancient Philosophy.** Detailed consideration of selected portions of the works of Plato and Aristotle. Suggested Works: Plato's Timaeus, Theaetetus and Philebus. Aristotle's Metaphysics. Prerequisite: Philosophy 200a, 210a. 2 hours.

454. **Continental Rationalism.** The Philosophy of Descartes, Leibnitz and Spinoza. Prerequisite: Philosophy 210a, 300a. 2 hours.

455. **The Philosophy of Kant.** The Critique of Pure Reason. Selected passages of the Critique of Judgment. Prerequisite: Philosophy 300a. 2 hours.

456. **Existential Philosophy and Phenomenology.** A study of selected readings. Prerequisite: Philosophy 300. With the consent of the instructor, this course is also open to general students with two full courses in philosophy. 2 hours.

457. **Metaphysics.** Theories of reality including study of such fundamental concepts as being, form, substance, causality, process, universal, and particular. Prerequisite: Philosophy 300. 2 hours.

460. **Problems.** Seminar projects not readily classifiable into the above categories. Prerequisite: Philosophy 300. 2 hours.

470-9. **Tutorials for Honour Students in Special Subjects.** 1 hour.

499. **Senior Honours Essay.** 1 hour.

Graduate Courses in Philosophy

After this calendar was prepared for the printer, the Graduate Council gave approval for an extensive programme of graduate studies in Philosophy. Please write to the Chairman for details.
PHYSICS

J. A. Cowan, B.Sc. (Manitoba), M.A., Ph.D. (Toronto)

G. E. Reesor, M.A. (McMaster), Ph.D. (Toronto)  -  -  -  -  Professor
R. A. Aziz, M.A., Ph.D. (Toronto)  -  -  -  -  Associate Professor
F. W. Boswell, M.A., Ph.D. (Toronto)  -  -  -  -  Associate Professor
I. R. Dagg, B.Sc. (Manitoba), M.S. (Pennsylvania State), Ph.D. (Toronto)

R. A. Snyder, Ph.D. (Western)  -  -  -  -  Associate Professor
D. E. Brodie, M.Sc., Ph.D. (McMaster)  -  -  -  -  Assistant Professor
H. K. Ellenton, B.Sc. (Western), M.A. (Toronto)  -  -  -  -  Assistant Professor
N. R. Isenor, B.Sc. (Acadia), M.Sc., Ph.D. (McMaster)  -  -  -  -  Assistant Professor
C. C. Lim, B.A. (DePauw), M.A. (Nebraska), Ph.D. (Toronto)  -  -  -  -  Assistant Professor
J. L. Ord, B.A.Sc., (Toronto), M.S., Ph.D. (Illinois)  -  -  -  -  Assistant Professor
M. G. Rochester, M.A. (Toronto), Ph.D. (Utah)  -  -  -  -  Assistant Professor
K. A. Woolner, B.Sc. (London)  -  -  -  -  Assistant Professor
J. M. Corbett, B.A.Sc. (Toronto), M.Sc. (Waterloo)  -  -  -  -  Lecturer

One-semester courses are indicated; all others are two semesters in length.

5. General Physics. A preliminary course in general physics, including vectors, statics, friction, rectilinear motion. Newton's laws; projectiles, impulse, momentum, circular motion, heat vibration, sound, electrostatics, capacitors, electrical energy and power. Light waves, rays, mirrors, lenses, optical instruments, photometry, interference, diffraction, and polarization.
3 lectures, 3 hours laboratory.

3 lectures, 3 hours laboratory.

12. Electricity and Magnetism I. An introductory course in electricity and magnetism with emphasis on field theory. Direct current circuits, meters, bridges, potentiometer, insulators, conductors and semiconductors; electrostatics, Coulomb's law, Gauss' law, the electric field, potential capacitance, dielectrics.
2 lectures, 3 hours laboratory, alternate weeks, half course for Electrical Engineering, 2 lectures, 3 hours laboratory, half course for Applied Physics.

13. Electricity and Magnetism II. Moving charges and magnetic fields, electromagnetic induction, inductance, the magnetic properties of matter, hysteresis, the magnetic circuit, brief introduction to transient and alternating current; Maxwell's equations, plane waves.
Prerequisite: Phys 12.
2 lectures, 3 hours laboratory, alternate weeks, half course for Engineering, 2 lectures, 3 hours laboratory, half course for Applied Physics.
14. **Optics.** Geometrical optics, interference, diffraction and polarization. 3 lectures, 3 hours laboratory, one term.

15. **Modern Physics.** Elementary particles, quantization of electromagnetic radiation, the wave nature of particles, atomic and nuclear structure. 3 lectures, one term.

33. **Atomic Physics.** Selected topics in the theory of relativity, quantization in classical physics, the atomic nature of matter, atomicity of electricity, the quantum theory of thermal radiation, particle aspects of electromagnetic radiation, structure of the hydrogen atom, the wave aspects of material particles, X-ray and electron diffraction, elementary wave mechanics, atomic spectra, X-ray spectra, quantum statistics. 3 lectures, one term.

42. **Structure of Solids.** Electronic structure of atoms and atomic bonding; crystal structure and space lattices; symmetry; crystal geometry; stereographic projections; theory of X-ray diffraction; X-ray methods; crystal formation; crystal defects; physical properties of crystals. 2 lectures, 3 hours laboratory, alternate weeks, one term.

43. **Nuclear Physics.** The atom and its nucleus, radioactive decay, nuclear masses and nuclear stability, nuclear spin and moments, structure of nuclei, gamma radiation processes, alpha decay, beta decay, nuclear reactions, fission, interaction of radiation with matter, counters, particle accelerators and reactors. 3 lectures, one term.


45. **Introductory Statistical Mechanics.** Review of essential classical and quantum mechanics; ensembles, microcanonical, canonical and grand canonical; quantum statistical mechanics, theory of the density matrix; applications. 3 lectures, one term.


131. **Mechanics, Wave Motion and Heat.** Vectors, rectilinear motion, plane motion, dynamics of particles, work and energy, linear momentum, rotational motion, statics, angular momentum, harmonic motion, gravitation, wave motion, sound waves, temperature, heat, first and second laws of thermodynamics, kinetic theory of gases. 3 lectures, 3 hours laboratory.

231. **Classical Mechanics I.** Vector analysis and its use in the study of vectorial mechanics; motion of a particle in one, two, and three dimensions; the conservation laws; dynamics of rigid bodies; moving co-ordinate systems. 2 lectures.

232. **Electricity and Magnetism.** An introduction to electricity and magnetism including Coulomb's law, electric fields, potential, Kirchhoff's laws, dielectrics, capacitance, magnetic fields, induction, Faraday's law, Lenz's law, inductance, permeability, ferromagnetism, hysteresis, domain theory, vector diagrams, the use of complex numbers, resonance, power, transformers. 2 lectures, 3 hours laboratory.

**Note:** Students enrolled in the Chemistry and Physics course take laboratory work in alternate weeks.
235. Optics. An elementary course in geometrical and physical optics. Refraction and reflection at plane and curved surfaces; thin and thick lenses; optical instruments. The wave nature of light: interference; diffraction; slits and gratings; resolution. Polarization; optical activity; photometry.
2 lectures, 3 hours laboratory.

Note: Students enrolled in the Chemistry and the Chemistry and Physics courses take laboratory work in alternate weeks.

237. Astronomy I. A survey course in astronomy. Aspects of the sky; motions of the earth; the earth and the moon; the solar system; gravitational astronomy; the sun; the stars; stellar motions; comets; meteors; meteorites; interstellar matter; the structure of the galaxy; exterior systems; cosmogony; radio astronomy.
3 lectures.

331. Classical Mechanics II. Moving co-ordinate systems and the special theory of relativity; relativistic dynamics of a particle. Rotating co-ordinate systems; rotation of a rigid body; the inertia tensor. Lagrange's equations. Dynamics of deformable matter; hydrodynamics; elasticity.
3 lectures.

2 lectures, 3 hours laboratory, alternate weeks for students not taking Physics 333.

333. Intermediate Laboratory. Selected experiments in mechanics, heat, sound, optics, spectroscopy, X-rays, atomic physics, electricity, magnetism, and electronics.
6 hours laboratory.

3 lectures.

3 lectures.

2 lectures.

337. Astronomy II. Selected topics in astrophysics, cosmogony, and radio-astronomy
2 lectures.

338. Geophysics I. An introductory course on the physics of the Earth. Origin, heat and temperature of the Earth, study of earthquakes and the Earth's interior through earthquake waves; gravity and isostasy; terrestrial magnetism; effects of heat, temperature and strain on rocks; origins of continents, mountain ranges; the ocean floors; meteorology; geophysical techniques.
2 lectures.
339. **Atomic and Nuclear Physics.** Fundamentals of modern physics: special theory of relativity, quantization of electromagnetic radiation, wave properties of particles, the hydrogen atom, atomic and X-ray spectra, nuclear structure, nuclear reactions, molecular and solid state physics.
3 lectures.

402. **X-ray and Spectrographic Analysis.** Crystallography, production and properties of X-rays, X-ray diffraction theory, photographic and spectrometric powder techniques, interpretation of powder diffraction data, applications of polycrystalline diffraction, X-ray fluorescence analysis, electron probe analysis. Atomic and molecular spectra, spectrographic techniques, absorption spectrophotometry, spectrographic analysis, Raman spectroscopy.
2 lectures, 3 hours laboratory, alternate weeks.

403. **Atomic and Nuclear Physics.** Atomic and nuclear structure, time dependence of radioactive decay, nuclear radiation—a study of nuclear decay by alpha, beta, gamma, neutron, proton, and deuteron emission, interaction of these particles with matter and their detection, neutron physics, fission, nuclear reactions and the complex nucleus, nuclear forces, nuclear models, new particles.
2 lectures.

404. **Theoretical Mechanics.** Fundamental ideas of analytical mechanics, generalized co-ordinates. Lagrange's formulation, applications of Lagrange's equations, Hamilton's formulation, co-ordinate transformations, the special theory of relativity.
2 lectures, 2 hours problems, one term.

431. **Quantum Mechanics.** Variational principles in mechanics; Hamilton's formulation of mechanics. Classical theory of small vibrations. Physical principles of the quantum theory; Schroedinger's wave mechanics; angular momentum operators; the hydrogen atom; perturbation theory.
2 lectures.

432. **Advanced Electronics.** Precision electrical measurements, special purpose tubes and solid state devices, high frequency electronics, pulse and digital circuits, stabilization techniques.
2 lectures.

433. **Advanced Laboratory.** Selected experiments in atomic and nuclear physics, solid state physics, and thermodynamics; electrical and electronic measurements; vacuum techniques. In addition, a short research problem will be assigned.
3, 6 or 9 hours laboratory.

434. **Atomic and Nuclear Physics II.** Identical particles, the exclusion principle, many-electron atoms, X-rays, nuclear particles, nuclear reactions, instruments.
2 lectures.

435. **Solid State Physics.** Electronic structure of atoms; atomic spectra; spectroscopic methods; atomic bonding; crystal structure and space lattices; symmetry; crystal geometry; X-ray diffraction theory and methods; crystal formation; defects; physical properties of crystals; free electron theory of metals; band theory of metals and semi-conductors.
2 lectures, 3 hours laboratory, alternate weeks, for students not taking Physics 433 (Advanced Lab.)

3 lectures.
437. Topics in Theoretical Physics. Selected subjects for advanced study. 2 lectures.

438. Geophysics II. 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.


441. Electromagnetic Theory. A generalized treatment of the basic laws of electricity and magnetism; mathematical techniques for the problems of electrostatics; solutions of Maxwell's equation in free space and the study of plane waves; theory of waveguides and introduction to radiation. 2 lectures.

442. Metal Physics. The course will provide explanations of the physical properties and behaviour of metals and alloys from the viewpoint of atomic physics. Topics included are: solidification of pure metals, perfect and imperfect crystals, alloys, phase diagrams, diffusion, solid state phase transformations, the iron-carbon system, physical properties of metal crystals, elastic and plastic deformation, twinning, radiation damage, recovery and recrystallization, creep, fatigue, fracture, internal friction, free electron and zone theories of metals, electrical, thermal and magnetic properties. 2 lectures.

501. Electromagnetic Theory. A review of the laws of electricity and magnetism which form the basis for Maxwell's equations. Solutions of Maxwell's equations in free space and subject to various boundary conditions, transmission line theory, radiation and antenna theory, ionosphere propagation. 2 lectures.


505. Seminar and Problem. Each student will prepare and present at least one paper on a technical subject related to his studies. Specific problems may be assigned for investigation and report. 4 hours.
2 lectures.


603. Solid State Physics. Crystal symmetry and bulk properties; binding energy; defects and their effect on diffusion, deformation, and optical properties; one-electron theory of solids; phonons and specific heat; transport processes and the electron-phonon interaction.


605. Atomic and Molecular Spectra. One or other of these courses may be offered each year. (a) The spectra emitted by atoms are treated on the basis of the vector model of the atom, as constructed from classical quantum theory and wave mechanics. Topics include: the Bohr-Sommerfeld model and wave mechanics of the hydrogen atom, the Schroedinger model of the alkali-like atoms with penetrating orbits, fine structure, hyperfine structure, the many electron model and exchange energy, Zeeman effect, selection rules and intensities of emitted radiation. (b) Emission and absorption of radiation by molecules. Topics include: rotational, vibrational and electronic spectra of diatomic molecules, the interaction of vibration and rotation and the finer details of infra-red and Raman spectra, electronic bands, dissociation, polyatomic molecules, intensities and selection rules of transitions.


608. Statistical Mechanics. Review of essential classical and quantum mechanics; ensembles, microcanonical, canonical and grand canonical; quantum statistical mechanics, theory of the density matrix; applications, mainly in solid state physics. one term.

609. Topics in Advanced Quantum Mechanics. One or more of the following courses may be offered, but not all will be available in any given year. Course 601 is a prerequisite.

(a) The Principles of Quantum Mechanics. The nature of quantum physics is demonstrated more directly by Dirac's symbolic method than by the usual historical method of presentation based on Schrödinger and Heisenberg mechanics. This course is an examination of the fundamental theoretical principles of the quantum theory, from the symbolic viewpoint.

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(b) **Group Theory and Quantum Mechanics.** Introduction to group theory: groups, representations of groups, character tables. Group theory and quantum mechanics, the permutation and rotation groups. Applications of the theory to atomic spectra, the theory of angular momentum, molecular symmetry and solid state physics.

(c) **Advanced Quantum Mechanics.** Dirac theory; the single particle description of relativistic quantum mechanics; bound state and scattering problems—the need for a many-particle (field) approach. Classical relativistic field theory, Feynman-Schwinger quantization of this theory. The radiation field, the electron field, interaction of these fields. The $S$-matrix; Compton scattering, Coulomb scattering. The magnetic moment of the electron, the Lamb shift. Renormalization.

610. **Electron Diffraction.** General theory of the diffraction of waves by crystals, experimental technique of electron diffraction, kinematic theory and interpretation of electron diffraction patterns, refraction of electron waves, atomic scattering, dynamical theory, electron interference effects in electron microscope images.

611. **Electron Optics and Electron Microscopy.** Electrons in electro-static fields, the electrostatic lens, the magnetic lens, aberrations, the electron microscope, electron specimen interactions, Fresnel diffraction and image contour phenomena, electron diffraction and dark-field microscopy, experimental methods in electron microscopy.

612. **Low Temperature Physics.** Production and measurement of very low temperatures. Low temperature materials and techniques. Thermal, magnetic and electrical properties of matter at very low temperatures. Superconductivity. Liquid helium.

613. **Selected Topics in Solid State Physics.** One or two of the following topics may be offered each year.

(a) **Imperfections in Crystals.** Perfect and imperfect crystals, general properties of point defects and dislocations, interactions of imperfections, solid state phase transformation, plastic deformation and work-hardening of metals, grain boundaries, influence of lattice imperfections on physical properties, internal friction in metals, diffusion, physical observation of lattice defects, generation and annealing of point defects, radiation damage.

(b) **Ionic Crystals and Luminescence.** The crystalline state — diffraction of X-rays, neutrons, electrons. Classification of solids. Lattice energy of ionic crystals — conductivity and diffusion. Band structure and electron distribution. Electronic and optical properties of alkali halides. (Photo-conductivity and luminescence.)

(c) **Inert Gas Solids.** Theory of crystal lattices: quantum mechanical basis, inter-atomic potentials, stability, dynamics of cubic close-packed lattices, thermodynamics of ideal crystals, anharmonicity. Experimental properties.

(d) **Advanced Quantum Theory of Solids.** Theoretical and experimental techniques for determination of the band structure of metals and semiconductors; electrical and thermal conduction processes and electron lattice interactions.

614. **Physics of the Earth’s Interior.** Selected topics in theoretical geophysics; seismology, rheology of the Earth, geomagnetism, the Earth’s rotation.
615. General Relativity and Cosmology. Tensor analysis: covariant and contravariant tensors, covariant differentiation, Riemannian space, geodesics, Ricci tensor, Christoffel symbols. General relativity: gravitation and special relativity, equivalence principle, field equations of general relativity, Schwarzschild metric, observational evidence for the general theory. Cosmology: Newtonian, Einstein and de Sitter universes, the expanding universe, cosmological principle and steady-state universe, observational clues.

616. Biophysics. The behaviour of some physical systems encountered in living organisms. Simple cell models: the cell membrane, diffusion problems, respiration, motion, instability and cell division, radiation damage. Specialized cells and organs: the nerve impulse and its propagation, muscle contraction, the red blood corpuscle, haemodynamics, selective filtration of ions, sensory transducers, temperature regulation, the central nervous system.

GEOLOGY

130. Introductory Geology. Minerals and rocks; geological processes and their effects; structural geology; applications of geology; historical geology; mineral and rock specimens; interpretation of geological and topographical maps; field trips. 2 lectures, 3 hours laboratory.

NATURAL SCIENCE

100. Physics and Chemistry. An introduction to the principles of physics and chemistry with emphasis on the historical development of scientific concepts and their significance both to our understanding of the physical universe and to contemporary society.

The extent of the universe, motion, causes of motion, energy; properties of matter, states of matter, basic chemistry, the periodic table; electricity, currents, fields, magnetism; radiation, optics, atomic structure, subatomic chemistry, chemical forces, organic chemistry.

Illustrations of basic principles will be taken from biochemistry, biophysics, geology, and astronomy. The laboratory part of the course is designed to show how scientists gain new knowledge and to point out the difficulties inherent in the use of apparatus. 3 lectures, 2 hours laboratory, alternate weeks.
POLITICAL SCIENCE

P. G. Cornell, M.A., Ph.D. (Toronto), E.D. - - Professor and Acting Chairman

N. E. Lavigne, C.R., B.A. (Western), B.Comm. (Ottawa), M.B.A. (Detroit)  Assistant Professor

T. H. Qualter, B.A. (New Zealand), Ph.D. (London)  - - Assistant Professor

(Mrs.) R. M. Rolph, B.A. (Toronto)  - - - - - Lecturer

Students electing either a single or double Honours Programme or a Major in Political Science are encouraged to register in Political Science 110 in their first year. Other students are encouraged to register in Political Science 100. Either of the 100 level courses will serve as a prerequisite for senior courses in Politics. Political Science 100a and 100b will also be offered, on a semester basis, as a social science elective for Engineering students, i.e., as Political Science 15.

15a. See 100a.

15b. See 100b.

Political Science 15a and 15b are offered alternately in succeeding terms. Either course will fulfill the social science requirement in Engineering Year II.

Other Political Science courses may be elected by Engineering students in senior years in consultation with the department.

100a. Contemporary Ideologies. A study of the origin, nature and impact of contemporary political doctrines including Communism, Fascism, Democratic Socialism and Democratic Capitalism.


3 lectures, half course.

100b. Government and Politics. A study of the theory and practice of modern government, with particular reference to the governments of Canada, the United States and Great Britain.

Text: Corry & Hodgetts, Democratic Government and Politics.

3 lectures, half course.

110. Democratic Government. A comparison of the various attempts to give practical application to the democratic idea. While concentration will be on the major democracies, attention will also be given to the democratic experiment in Scandinavia, Switzerland and the Commonwealth.

3 lectures.

201a. American Government and Politics. The theory and practice of American government and politics at the federal and state levels.


3 lectures, half course.

201b. British Government and Politics. The theory and practice of government and politics in Great Britain.

Texts: Amery, Thoughts on the Constitution; White & Hussey, Government.

3 lectures, half course.


3 lectures.
210. **Canadian Political Institutions.** A critical examination of contemporary Canadian government and politics.  
3 lectures.

220. **The History of Political Theory.** A survey of the history of western political theory from the time of Socrates to the present day. (This course is designed specifically for Honours students in other disciplines. Political Science Majors may be admitted by consent of the instructor.)  
3 lectures.

251. **Political Theory from Socrates to Hobbes.**  
3 lectures.

252. **Political Theory from Hobbes to the Present Day.**  
3 lectures.  
**Note:** Political Science 251 and 252 make a more detailed study of the material outlined in Political Science 220. These courses are designed specifically for Honours students in Political Science, although others may be admitted by consent of the instructor.

260. **International Politics.** The politics of peace and conflict; a study of the causes of inter-state conflict and its adjustment through diplomacy, law and war.  
3 lectures.

270. **Public Administration.** A comparative analysis of the public services of the major democracies with particular reference to the legal basis, organization and political and judicial control of the administrative processes.  
3 lectures.

351. **The State and Economic Life.** A study of the interrelation of political and economic theory and of the political-economic consequences of the welfare state.  
3 lectures.

360. **Parties and Pressure Groups in the Modern State.** An analytical and comparative treatment of the structure and role of political parties and pressure groups in the modern state.  
Prerequisite: Political Science 201a & b or 210.  
3 lectures.

362. **The Electoral Process.** An analytical and comparative treatment of electoral machinery and law, election strategy and tactics and voting behaviour.  
Prerequisite: Political Science 201a & b or 210.  
3 lectures.

370a. **Comparative Institutions - Legislatures.** A comparative study of the legislative process in selected countries.  
3 lectures, half course.

370bi **Comparative Institutions - The Executive.** A comparative study of the organization and role of the executive in selected countries.  
3 lectures, half course.
375. Federalism - Classical and Co-operative. A study of the evolution, structure, and functions of modern federalism. Prerequisite: Political Science 201a & b or 210. 3 lectures.

380. The Developing Commonwealth. A study of the Commonwealth as a whole and of the changing pattern of government of the member nations, particularly the recently independent Afro-Asian states. 3 lectures.


401. Political Theory. A detailed study of the political theory of one fairly limited period or school. (1963-64): English political theory of the nineteenth century. 3 lectures.

405. Local and Provincial Government. A study of the development, structure, functions, machinery and finances of Canadian local and provincial governments. Prerequisite: Political Science 210. 3 lectures.

410. Propaganda and Public Opinion. A detailed study of the nature of public opinion and the attempt to control it through propaganda. Prerequisite: Political Science 360 or 362. 3 lectures.

415. Political Behaviour. An introduction to quantitative methods in the study of political behaviour, especially in relation to voting patterns, and political participation. Prerequisite: Political Science 360 or 362. 3 lectures.
PSYCHOLOGY

W. H. Bexton, B.A. (McMaster), M.A. (Saskatchewan), Ph.D. (McGill)
Professor and Acting Chairman of the Department

R. K. Banks, M.A. (Toronto) - - - - - - - - Lecturer
(Mrs.) M. D. Vogel-Sprott, B.A. (McMaster), M.A., Ph.D. (Toronto) - Lecturer

Psychology 100, or its equivalent, is a prerequisite for all other courses in psychology. For courses at the 300 level, students will normally be expected to have had at least one course in psychology at the 200 level. Courses at the 400 level are open only to honors students, or students qualifying for a graduate degree, who have an adequate background in psychology.

15. Introductory Psychology. A short introduction to the methodology and basic principles of some of the major areas of modern psychology such as learning, emotion, perception, and individual differences. (For Engineering students only.)
3 lectures, half course.

100. Introductory Psychology. This course is designed to provide the students with an understanding of the basic concepts and techniques of modern psychology as a behavioral science. The development of behavior, learning, motivation, emotion, sensation and perception, and individual differences will be studied with reference to the physiological correlates and to environmental factors.
3 lectures.

100J. General Psychology. Nature of psychology; organic life, sensory life and its philosophy; intellectual life and its philosophy.
3 lectures.

210. Development and Behavior. The genesis and development of behavior of the human will be traced from conception to maturity. Physiological changes, and socializing processes will be considered in relation to the development of sensory, motor, symbolic and emotional processes. The nature and development of social behavior and personality will also be studied.
3 lectures.

220. Principles of Learning. This course is designed to introduce the student to learning theory and also to provide an understanding of experimental techniques in this area. The nature of learning will be considered from the establishment of conditioned responses to the development of complex skills. Theories of learning will be critically examined and the application of research findings to the improvement of learning skills will be considered. Laboratory sessions will demonstrate various aspects of learning.
2 lectures, 2 hours laboratory.

230. Physiological and Comparative Psychology. A study in the relationship between patterns of behavior and physiological processes with comparisons along the phylogenetic scale from infrahuman species to man.
3 lectures.

236J. Developmental Psychology. Mental health; development, heredity, environment; the school, personal activity, problems of education.
3 lectures.
240. **Social Psychology.** In this course the student will study the processes of communication and socialization in social interaction and in the development of the individual. The interaction of the individual with social groups will be considered with reference to concepts such as norms, social roles, leadership-followership, attitudes, opinion and prejudices.

3 lectures.

310. **Psychopathology.** Personality and adjustment will be considered with special reference to factors related to abnormal behavior. The neuroses and psychoses, both psychogenic and organic, will be studied in some detail with regard to typical symptoms in various diagnostic categories, probable dynamics, typical therapy and prognosis. Time will also be devoted to an examination of current research on behaviour disorders.

3 lectures.

320. **Sensation and Perception.** The characteristics of sensation and perception will be studied in relation to the physics of the stimuli and physiology of the sensory apparatus. Various characteristics of perception will be studied including perceptual organization, factors of attention, illusions.

2 lectures, 2 hours laboratory.

340. **Applied Psychology.** This course will survey the fields of Applied Psychology and consider the application of behavioural studies to areas such as industry, education, business and medicine.

3 lectures.

350. **Personality Theory.** An examination and evaluation of some of the outstanding theories of personality.

3 lectures.

410. **The History of Psychology.** Psychological thought from the classical Greek period to the modern period with emphasis on the development of scientific psychology.

3 lectures.

420. **Differential Psychology.** The basic problems in measuring individual differences in intelligence, personality and other characteristics, will be studied. Tests will be critically examined and the application of tests to counselling, selection and guidance will be considered.

2 lectures, 1 hour laboratory.

430. **Problems in Contemporary Psychology.** Conducted, for the most part, as a seminar class, the purpose of this course will be to examine the latest developments in psychology, chiefly through journal publications, so as to evaluate contemporary trends in research and theory.

2 lectures.

440. **Research.** Each student will work under the direction of a member of the department on a specific topic for scientific investigation. The results of this investigation will be presented in the form of a thesis which will be critically examined by members of the department and, also, where pertinent, by members of other departments.
RELIGIOUS KNOWLEDGE

Professor G

W. B. Mayer, C.R., Ph.D., S.T.D. (Gregorian)  -  -  Assistant Professor J

D. J. Hall, B.A. (Western Ontario), S.T.M. (Union Theo. Sem., New York), Lecturer P

M. E. Pinkney, B.A. (Sir George Williams), B.D. (McGill), S.T.M., (G.T.S., New York)  -  -  -  -  -  -  -  Lecturer R

50J. Grace and the Sacraments. Grace; concepts pertaining to all the sacraments; the meaning of sacramental life to the individual and to society.
3 lectures.

100J. Christian Apologetics. Establishment of the claims of Christianity; the divinity of Christ; the Church; sources of dogma; faith; God and His nature; the divine attributes; the Trinity; Incarnation; Redemption; Mariology.
3 lectures.

100R. Survey of Biblical Literature. A survey of Biblical literature, with consideration of the documentary sources, historical context, and interpretation of both the Old and New Testaments.
3 lectures.

100P. 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.

110P. Christian Doctrine. An introductory survey of the basic tenets of Christian belief, including the doctrines of Revelation, of the Trinity, of Man of God's activity in History, of the Church, of Scripture.
3 lectures.

110R. History and Philosophy of the World's Major Religions. The history and philosophy of the world's major religions, compared and contrasted with the unique message of Christianity.
3 lectures.

200G. The Left Wing of the Reformation. The history and philosophy of the sixteenth century sectarians contrasted with the major reformers and evaluation of their place in modern Christianity.
3 lectures.

200J. Sacred Scriptures. Inspiration; origin; the canon of the Scriptures; manuscripts and versions; Biblical history of the Old and New Testaments.
3 lectures.

300J. Catholic Social Doctrines. The Church and society; the pronouncements of the Church on civil, domestic, professional and international societies.
3 lectures.
ROMANCE LANGUAGES

J. C. McKegney, B.A. (Western), M.A. (Oregon), Ph.D. (Washington)

Associate Professor and Acting Chairman of the Department

M. I. Kieffer, C.R., B.A. (St. Louis), M.A. (McGill), J.C.D. (Gregorian), Professor

J. R. Finn, C.R., B.A. (Western), M.A. (Toronto), Ph.D. (Illinois), Associate Professor

R. L. Myers, B.A. (Western), M.A., Ph.D. (Johns Hopkins) - Associate Professor

(Mrs.) D. Walter, M.A. (Queen's) - - - - - Associate Professor

Z. T. Ralston, C.R., B.A. (Western), M.A. (Laval), Ph.D. (Catholic University of America) - - - - - - - - Assistant Professor

H. S. Robertson, B.A. ( McMaster), A.M., Ph.D. (Indiana) - Assistant Professor

R. Skyrme, B.A. (Bristol) - - - - - - - - Lecturer

FRENCH

A General Arts student majoring in French will complete French 100A, 200, 300 and any two Honours courses chosen in consultation with the departmental chairman.

501. Preliminary Year French. Authors and Composition. The Ontario Grade 13 curriculum will be followed.
4 lectures.

100. A Survey of French Literature from the Middle Ages to the Present Day. Oral practice in the Language Laboratory.
Prerequisite: Grade 13 French. (This course is open to any qualified student not honouring or majoring in French)
3 lectures.

100A. French Literature of the First Half of the 19th Century. Lectures and written reports. Intensive grammar review with use of the Language Laboratory.
Prerequisite: Grade 13 French. (This course is open only to students majoring in French).
4 lectures.

Prerequisite: French 100.
3 lectures.

Prerequisite: French 100.
3 lectures.

250. French Composition, Oral Practice, Phonetics. The language laboratory will be used regularly.
Prerequisite: French 100.
2 lectures.

251. Phonetics and Conversation.
1 lecture.
260. French Literature and Culture of the Seventeenth Century. Lectures, reports, discussion. Prerequisite: French 100. 3 lectures.

300. Survey of the French Drama. A study of typical examples of French drama from the 17th century to the present. Not offered in 1963-64. Prerequisite: French 100. 3 lectures.

310J. Survey in Literary History of French Literature of the 20th Century in France. Prerequisite: French 100. 3 lectures.

320J. Survey in Literary History of French Literature from the Revolution to Zola. Prerequisite: French 100. 3 lectures.


350. Prose Composition, Grammar and Oral Practice. The Language Laboratory will be used regularly. Prerequisite: French 250. 2 lectures.

360. French Literature of the Eighteenth Century. Lectures, readings, reports. Prerequisite: French 260. 3 lectures.

370. French Literature from Balzac to World War I. Prerequisite: French 260. 3 lectures.

450. Advanced Composition and Oral Practice. The Language Laboratory will be used regularly. Prerequisite: French 350. 2 lectures.

460. Sixteenth Century French Literature. Lectures and seminars. Prerequisite: French 360. 2 lectures.

470. Medieval French. Reading of Old French; survey of Medieval French literature, beginning with La Chanson de Roland. Lectures, reports. Prerequisite: French 370. 2 lectures.

480. French Prose and Drama Since World War I. Lectures and Seminars. Prerequisite: French 360. 2 lectures.

ITALIAN

12J. Beginning Italian. Grammar, composition, conversation. The Language Laboratory will be used. 4 lectures.

50J. Preliminary Year Italian. Intermediate grammar and composition. Translation of authors, conversation. The Language Laboratory will be used. 4 lectures.

100J. A Survey of Literature, with Grammar and Oral Practice. 3 lectures.
SPANISH

General Arts students who wish to major in Spanish will take Spanish 100, 200, 300
and any two Honours Spanish courses chosen in consultation with the department
chairman.

1-50.  Introduction to Spanish.  Intensive drill in the fundamentals of grammar
and composition.  The language laboratory will be used regularly.  No prerequisite,
though the student should have Grade XIII French.
5 lectures.

100.  Survey of Spanish Literature.  Intensive review of grammar and composi-
tion.  Survey of Spanish literature.  The language laboratory will be used regularly.
Prerequisite: Spanish 1-50 or Grade XIII Spanish.
4 lectures.

200.  Survey of the Spanish Novel.  For students in General Arts only.  Critical sur-
vey of representative Spanish novels, from Lazarillo de Tormes to the mid-twentieth
century.  Lectures, readings, reports.
Prerequisite: Spanish 100.
3 lectures.

210.  Spanish Civilization.  A study in English of the main historical and cultural
currents in Spain and Spanish America. (Honours Spanish students may not take this
course for credit.)
3 lectures.

250.  Advanced Composition and Conversation.  Phonetics, intensive study of
grammar, oral practice, practice in the language laboratory.
Prerequisite: Spanish 100.
3 lectures.

260.  Prose and Drama of the 18th and 19th Centuries.  Critical reading of the
principal authors and playwrights of the period.  Lectures in Spanish, readings, reports.
Prerequisite: Spanish 100.
3 lectures.

300.  Survey of the Spanish Drama.  For students in General Arts only.  Critical
survey of representative Spanish plays, from Juan del Encina to the mid-twentieth
century.  Lectures, readings, reports.
Prerequisite: Spanish 200.
3 lectures.

350.  Advanced Composition.  Writing of essays based on critical examination of
selected plays and novels; discussion, in Spanish, of these works; practice in the lan-
guage laboratory.
Prerequisite: Spanish 250.
2 lectures.

360.  Spanish Prose and Drama of the 16th and 17th Centuries.  Critical study
of the literature of the Spanish Golden Age.
Prerequisite: Spanish 260.
2 lectures.

370.  Survey of Spanish American Literature.  A critical study of Spanish American
literature from the Cortes letters to the present.
Prerequisite: Spanish 100.
3 lectures.

450.  Senior Spanish Composition and Oral Practice.  The language laboratory
will be used regularly.
Prerequisite: Spanish 350.
2 lectures
CURRICULA AND COURSES OF STUDY

460. Spanish Literature of the 20th Century. Critical examination of the works of the most significant writers of this Century. Lectures in Spanish. Prerequisite: Spanish 360. 2 lectures.

470. Medieval Spanish. Study of the literature from the beginnings to 1500 A.D.; introduction to Old Spanish grammar; elementary Portuguese. Prerequisite: Spanish 370. 2 lectures.

480. Survey of Spanish Poetry. From the Poema del Cid to the present. Lectures, reports. Prerequisite: Spanish 300 or 360. 2 lectures.
Sociology

N. H. High, M.S., Ph.D. (Cornell)
Professor and Chairman of the Department, Dean of the Faculty of Arts

Professor

G. Campbell, B.A. (British Columbia), M.A. (Toronto)  -  Assistant Professor
W. G. Scott, B.A. (Western), M.A. (Toronto)  -  Assistant Professor
W. I. Brown, C.R., B.A. (Western)  -  Lecturer

With the exception of 360, 450, 470, which are open to Honours students only, the following courses are open to both General and Honours students.

15. Sociology. A general introduction to the subject covering the main concepts, theories, and ideas and how they relate to the study of groups in society.
3 lectures, half course.

100. Introductory Sociology. An introduction to the study of human beings in their group relationships including interaction within and between groups of people.
3 lectures.

250. Criminology. The study of the development of criminal or unlawful behaviour, its causes and treatment.
3 lectures.

260. Population and Human Ecology. The causes of population growth and decline, the composition and disposition of population, problems of fertility and longevity, optimum population analysis, prediction of trends with special application to Canadian problems.
3 lectures.

270. Communication. An analysis of the role of language and other symbol systems in social interaction; the formation of attitudes through language; the problem of 'expectancy set'; social and individual disorders as caused by, and reflected in, the breakdown of the communication process; the transmission of culture; the contributions of 'General Semantics' to Communications.
3 lectures.

350. Industrial Sociology. The study of the social processes and social systems in business and industrial organizations and a consideration of the human relations problems which exist in them.
3 lectures.

360. Methods of Sociological Research. Research techniques and problems including the use of questionnaires, interviews, attitude scales, and sociometric approaches.
3 lectures.

370. Sociology of the Family. 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.
3 lectures.
CURRICULA AND COURSES OF STUDY

450. **History of Sociological Theory.** A review of the important contributions made in the past to the understanding of human society including the ideas of Bentham, Comte, Cooley, Spencer, Durkheim, Gumplovicz, Marx, Pareto, Simmel, Weber and Thomas.
3 lectures.

460. **Social Organization.** The structure and function of various institutions, classes and kinship groups within society and their relationships to one another.
3 lectures.

465. **Sociology of Religion.** An examination of religion as a social institution and its place in human societies. The course seeks to develop an understanding of the universality of religion and its effect on man's social relations and human behaviour.
3 lectures.

470. **Seminar.** Research problems and assignments.
VII

GENERAL INFORMATION
GENERAL INFORMATION

Athletic Facilities
The athletic facilities of the University are housed at Seagram Stadium, which contains a fully-equipped gymnasium, a quarter-mile track, and a football field.

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, are:
Arms: Or, a chevron sable surmounted by a chevronell argent between three lions rampant gules.
Crest: Between two maple branches in saltire a trillium, displayed and leaved, all proper
Supporters: Two laurel branches joined in saltire below the shield, proper
Motto: Concordia Cum Veritate

Department of University Extension
An educated person is one who continues throughout life to develop his intellect. Robert Redfield has said that a person is not educated unless he assumes command of his own growth. In this respect, a university cannot be dedicated solely to the service of the youthful elite. One of the unusual features of our society is the need for continuing education at all levels in all age groups. Thus, educational opportunities for part time adult studies must occupy an essential position in a university.
The activities available to adult students at the University of Waterloo vary from the formal to informal, from residential seminars to weekly meetings, from practical—vocational, technical or professional—courses to classes dealing with questions of meaning and value.
Programmes are available to broaden the preparation and skills of high school teachers. There are programmes designed in co-operation with such groups as business, labour and government. To assist groups to determine their own educational goals and carry them out in the atmosphere of a university, the Department of University Extension has established a Conference Division. In order to create a climate for the further development of the cultural arts in the University and community, the Department of Extension has assumed responsibility for the administration of the Arts Theatre. In a word, the purpose of the Department of Extension is to expand the opportunities for all men and women to continue their education throughout life.
Courses are generally arranged in co-operation with sponsoring organizations. The Course programme consists of two terms a year, thirteen weeks each, with classes held once a week two hours in length. There are four categories of instruction:
(1) Academic courses and courses in the performing and cultural arts.
(2) Four year courses set up by such chartered organizations as Canadian Industrial Management and The Society of Industrial and Cost Accountants of Ontario which give designations C.I.M. and R.I.A.
(3) Two or three year courses for which an Adult Education Certificate is given.
(4) One term business courses of thirteen weeks.
Adult Education classes have been held in Guelph, Galt, Ayr, Brantford, Woodstock and Stratford as well as the University of Waterloo. Registrations during the University year of 1962-1963 totalled two thousand in fifty courses.
For detailed information concerning any Extension activity write,
Director of University Extension, University of Waterloo.
Library Facilities

At present there are two main centres of library service and study on the campus. The Arts Library is situated on the third floor of the Physics and Mathematics Building, and contains all books and periodicals in the Humanities and the Social Sciences. Library materials in Science and Engineering occupy a spacious new library on the ground floor, west wing, of the Engineering Building.

The Library regularly receives more than one thousand current periodicals. Its present holdings of almost sixty thousand volumes are being increased at the rate of twenty thousand volumes per year. In addition to materials in book and pamphlet form, it possesses a collection of phonorecords, microfilms and microcards, which is constantly growing. Microfilm and microcard readers are provided in each library. A Library Handbook is issued to all students explaining the arrangement of Library materials, the classification system, circulation procedures, and general rules and regulations. The Library staff will be happy to assist all students in order that they make the best possible use of the Library collections and facilities.

Residence

Students in all faculties are eligible to apply for residence in either St. Jerome's College, Renison College or St. Paul's College.

St. Jerome's College have available a men's residence with accommodation for one hundred students and a women's residence with accommodation for fifty-five students under the supervision of the School Sisters of Notre Dame.

Renison College offers residence accommodation for forty men and forty women.

St. Paul's College offers residence accommodation for 100 men and 50 women. The residence fee per academic year is $600 for men and $570 for women. This fee is for a double room, an additional fee of $90 is charged for a single room. Application for residence should be made directly to the College concerned on the appropriate form. Until such time as the University can provide additional residence facilities, suitable accommodation may be obtained in private homes. Prospective students may obtain a list of these homes by applying in person to the Office of the Registrar after they have been accepted by the University.

Student Activities

Government—Student Government at the University of Waterloo is centered in the Students' Council. The aims of this Council are listed as:

(a) To promote the general interests of the student body of the University,
(b) To serve as a bond of union between the students, alumni, graduates of the various faculties, and the affiliated and federated colleges,
(c) To be the principal means of communication between the University authorities and the student body,
(d) To represent the student body at University functions and on public occasions.

In addition to the Students' Council, each undergraduate faculty has its own society which promotes the interests of the students in that particular faculty.

Clubs and Activities—Among the many campus organizations in which students take part are Radio Amateurs' Club, Psychology, Philosophy, and Geography Clubs, German and Russian Clubs, Circle K Club, I.V.C.E., Canterbury Club, Student Christian Movement, Engineering Institute of Canada (Student Chapter), Debating Union, Laureate Society (Women's Undergraduate Association), National Federation of University Students, World University Service.

Music facilities of the University are in the Theatre Wing of the Arts Building. Two individual practice studios equipped with pianos with two large rehearsal rooms are available for the use of students. Arrangements for use of these facilities are made with the Director of Music. Performing groups in music include the University Chorus, Glee Club, Jazz Workshop, Orchestra, and other instrumental groups.

The interests of the students within the University in the theatre are served by the University of Waterloo Drama Council. Students may participate in managing or producing of, or acting in, radio and theatre performances. The Drama Council often collaborates with the Music Council to provide music-drama activities.
The Canadian Officers' Training Corps (C.O.T.C.)

1. The Canadian Officers' Training Corps offers undergraduates an opportunity to qualify for commissions in the Canadian Army, either Active or Reserve, through a training programme especially designed to meet their requirements.

2. Students are eligible who are:

   (a) British subjects or Canadian citizens between the ages of seventeen and twenty-five, these requirements may be varied to allow a higher age of entry for men who were on active service during the war of 1939-45, and those entering special Corps.

   (b) Of a physical standard suitable for the Canadian Army Active Force.

   (c) Following a course of study leading to a recognized degree.

3. Training provided is in two parts:

   (a) Two hours a week of theoretical training in military subjects during the academic year.

   (b) Twelve to twenty-two weeks of practical training during the summer, depending upon the length of the vacation period and the candidate's choice. Training will be as follows:

      (i) First and second years—at Corps Schools of the Canadian Army Active Force.

      (ii) Third year—practical leadership in charge of a troop, section, or detachment at an Active Force Unit or camp in Canada or Europe.

4. Students accepted for C.O.T.C. training are granted the rank of Officer Cadet during the first two years and in the third year are appointed as Second Lieutenants. They are eligible for pay according to their rank ($210 a month) for every full day of military duty. For this purpose, four hours of lectures during the academic year count as one day's duty, each day spent at a summer camp, to a maximum of twenty-two weeks, also counts.

Students wishing to apply for C.O.T.C. training should present themselves to the Officer Commanding before November 1, after which date no applications will be considered.

University Naval Training Division (U.N.T.D.)

The purpose of the University Naval Training Divisions is to select and train university students for commissioned rank in the Royal Canadian Navy (Reserve).

1. Admission Requirements

   (a) The candidate must be a Canadian citizen, or British subject resident in Canada with the status of a landed immigrant.

   (b) He must be medically fit, possess the required officer-like qualifications and have a sound academic record.

   (c) He must be seventeen but not over twenty-two years of age prior to December 31 in the year of his enrolment in the U.N.T.D.

   (d) He must be registered in the first or second year of university work.

Students should apply for enrolment in the U.N.T.D. during the first two weeks of registration. An information centre is located on the campus during certain days of the week of registration. An officer in attendance to assist all interested students. In addition, students interested in a career as either a Permanent Force Naval Officer or an officer in the Royal Canadian Navy (Reserve) may apply to the Department of Co-ordination and Placement for further information.

3. Selection Boards

Students who join the U.N.T.D. are entered as probationary cadets on the Active list of the Royal Canadian Navy (Reserve) and during January of their first year appear before a Selection Board to determine their suitability for commissioned rank. Successful candidates are promoted to the rank of Cadet in the Royal Canadian Navy (Reserve).

4. Training Programme

(a) During the academic year the U.N.T.D. training programme consists of one training night a week commencing in late September. The training is carried out through the media of lectures and instructional films and requires three winters to complete. Cadets from the University of Waterloo will train with cadets of the Ontario Agricultural College at Guelph during the winter. Transportation to and from the College is arranged.

(b) During the summer, Cadets must train a minimum of seventeen weeks during their first two summers in ships and establishments of the Atlantic Command. The third summer training period is optional. Cadets may avail themselves of the opportunity to serve longer than seventeen weeks each summer if they so desire.

5. Rates of Pay

(a) During winter training, Cadets may receive up to sixteen days' pay for attendance on training nights or a maximum of one hundred and twenty dollars ($120.00).

(b) During the summer training, Cadets receive pay at the rate of $225.00 per month plus transportation and travelling expenses. In addition, rations, quarters, and medical services are supplied.

6. General

(a) Cadets are issued with all required uniforms.

(b) When a Cadet has successfully completed three winters and two summers he will appear before a promotion board for his final assessment for commissioned rank. If he passes this board he will be promoted to Sub-Lieutenant at the commencement of the next academic year.

7. Regular Officer Training Plan (R.O.T.P.)

Naval cadets enrolled at the University under the Regular Officers Training Plan are students who have selected the Navy as a permanent career. These cadets take their winter training with U.N.T.D. Cadets and their summer training in ships of the Pacific Command. More detailed information on this plan can be obtained from:

Director, Department of Co-ordination and Placement, or by writing to:
Area Recruiting Officer,
Room 436,
National Revenue Building,
150 Main Street West,
Hamilton, Ontario.
Regular Officer Training Plan (R.O.T.P.)

Under the R.O.T.P., undergraduates who are successful applicants are enrolled as Officer Cadets in the Canadian Army.

Applicants must be Canadian citizens or British subjects, single, and under twenty-one at the commencement of their university or college training. If application is made prior to entry at university or college, it should be sent in writing to R.O.T.P. Selection Board, National Defence Headquarters, Ottawa, Ontario. If the application is delayed until after admission to university, it should be sent to the District Recruiting Office, Kitchener, Ontario.

For successful applicants, the cost of books, instruments, tuition, and other essential fees, will be borne by the Department of National Defence. The scale of pay and allowance under this plan is:

(a) During the academic year, pay of $63.00 a month and subsistence of $65.00 a month, for a total of $128.00 a month.

(b) During the period of practical summer training, pay of $63.00 a month, with food and lodging provided.

Cadets will be issued with standard service uniforms and equipment.

Free medical and dental care and annual leave with full pay will be received throughout the entire training period.

On successful completion of academic and military training, cadets will be promoted to Commissioned Officer rank in the Regular Force. The privilege of release, if desired, will be honoured after three years' service as a commissioned officer.

Note: Because of the requirement of three years' service in the Regular Force, students participating in the R.O.T.P. will not be able to undertake graduate work immediately.
FINANCIAL AID TO STUDENTS
FINANCIAL AID TO STUDENTS
UNDERGRADUATE SCHOLARSHIPS, BURSARIES,
PRIZES AND LOANS

University of Waterloo National Scholarships

Four University of Waterloo National Scholarships are offered annually to students displaying exceptional academic ability. One award will be granted to a student from each of the following regions: the Maritime Provinces, Quebec, Ontario, the Western Provinces. Holders of these scholarships will receive the title of "University National Scholar" and will be so listed in University publications.

Awards will be made by the Scholarships Committee under the following general conditions:

(a) Applicants must have attained a minimum average of 90% in the nine Ontario Grade XIII papers required for admission, or the equivalent.

(b) The annual value of this award shall be the cost of tuition and incidental fees, as well as an additional $1,000, for the duration of the undergraduate course provided that, in the opinion of the awarding committee, the scholar maintains a sufficiently high academic standing.

(c) A University National Scholar is eligible to hold additional awards.

(d) Application must be made prior to June 1, on forms provided by the Office of the Registrar.

University of Waterloo Tuition Scholarships

University of Waterloo Tuition Scholarships are awarded annually to students of high academic achievement who are applying for entry to any faculty of the University, and to students proceeding to advanced years. Scholarship holders will receive the title of "University Scholar" and will be so listed in University publications.

Awards will be made by the Scholarships Committee under the following general conditions:

(a) Students entering the First Year must have attained a minimum average of 80% in the nine Ontario Grade XIII papers required for admission to their particular faculty.

(b) Students entering advanced years must have attained a minimum average of 80% in the final examinations of the preceding academic year.

(c) University of Waterloo Tuition Scholarships shall be renewable annually provided that, in the opinion of the awarding committee, the scholar maintains a sufficiently high academic standing.

(d) The value of the Scholarship shall be the value of the tuition fee and incidental fees of the holder. Residence fees are not included.

(e) A University Scholar is eligible to hold additional awards.

(f) Students entering the First Year must apply for the University of Waterloo Tuition Scholarships prior to June 1, on forms provided by the Office of the Registrar. No application is necessary for students in advanced years.
National and University Scholars

The following students have been named University National and University Scholars for the 1962-63 academic year.

University National Scholars
Leonard Gottselig
  Balgonie, Saskatchewan  Arts I
Patsie Lorraine Hutton
  Glentworth, Saskatchewan  Arts II

University Scholars
James Edward Abel
  Bridgeport, Ontario  Arts II
David Ture Ahlberg
  St. Catharines, Ontario  Engineering II
Arni Neil Arnason
  Ottawa, Ontario  Science I
William Gilbert Babichuk
  Fort William, Ontario  Science I
Roger Beaulieu
  Strickland, Ontario  Engineering I
Gary Edmund Blau
  Kitchener, Ontario  Engineering III
Forbes John Burkowski
  Port Arthur, Ontario  Science I
James Powell Challancin
  Crystal Falls, Michigan  Arts II
Judith Lane Clifferton
  Crystal Springs, Sask.  Arts I
William Hamilton Colborne
  Terrace Bay, Ontario  Science I
Michael Stuart Corlett
  Toronto, Ontario  Engineering II
Karl Edgar Dick
  Waterloo, Ontario  Science II
Robin Michael Dodson
  Guelph, Ontario  Engineering II
Michael Saylor Doyle
  Toronto, Ontario  Engineering II
John Frederick Eix
  Waterloo, Ontario  Science III
Walter Erich Elstner
  Waterloo, Ontario  Engineering II
Jeffrey Taylor Evans
  Guelph, Ontario  Science I
Harry Roland Fischer
  North Bay, Ontario  Engineering III
Bryan Earl Fletcher
  Summerside, P.E.I.  Engineering II
Patrick Leo Fortney
  Hanover, Ontario  Engineering V
John Arnold Frost
  Waterloo, Ontario  Engineering II
David Earl Gabel
  Kitchener, Ontario  Science I
Hans-Joachim Geisler
  St. Catharines, Ontario  Science I
Michael Howard Girdwood
  Guelph, Ontario  Engineering I
Robert Lyle Hackney
  Sarnia, Ontario  Engineering V
Vincent Carl Hamacher
  Parkhill, Ontario  Engineering V
Ross Beverly Hebner
  Midland, Ontario  Engineering II
Carl Lenard Heck
  Kitchener, Ontario  Engineering V
William James Hillier
  Camlachie, Ontario  Engineering III
Roy Hoffman
  Waterloo, Ontario  Engineering III
Inta Janson
  Virgil, Ontario  Science I
Michael David Johnson
  Kirkland Lake, Ontario  Science I
Gordon Keir
  St. Catharines, Ontario  Engineering II
Roger Alfred Kingsley
  Kitchener, Ontario  Science I
Elizabeth Louise Klein
  Tavistock, Ontario  Science III
Earl David Koch
  New Hamburg, Ontario  Science IV
Philip John Kuntz
  Waterloo, Ontario  Science III
Jerald Franklin Lawless
  Kirkland Lake, Ontario  Science I
FINANCIAL AID TO STUDENTS

Sharon Frances Lee
Larry Clifford Lipskie
John David Luyt
Douglas Samuel Magnusson
Markus Frederick Motsch
David William Muir
Sharon Anne Murphy
Wayne Rcss MacCallum
William David McCready
John Peter McClure
William Williamson McGrattan
Robert Lorne MacKinnon
George Edmund McMaster
David John McNaughton
Gregory McNeice
James Donald Nagel
Philip David Neufeld
Catherine Anne Neumann
Susan Jane Nichols
Gwen Agnes Nowak
Guenther Odlozinski
Eberhard Paul
John Michael Philp
Robert Morton Raphael
William Lynn Renwick
Margaret Ann Rosser
Roger Leslie Saunders
William George Schneider
Kathleen Jean Skelton
Buddy Michael Slocki
John David Smye
Cornelius Daniel Stoffer
Allan Bruce Strong
Harry Francis Sullivan
Marta Veronica Tomins
John Raymond Trebish
Donald Wayne Trim
John Kenneth Vranch
Pauline Winifred Watts
Ruth Elva Claire Weir
James Ernest Welch
Lawrence Alexander White
Diane Elizabeth Winkler
Arthur Louis Young
David Campbell Younger
Charles Robert Zarnke

Fort William, Ontario
Kitchener, Ontario
Chatham, Ontario
Keewatin, Ontario
Kitchener, Ontario
Toronto, Ontario
Pembroke, Ontario
Guelph, Ontario
Owen Sound, Ontario
Toronto, Ontario
Dobinton, Ontario
Kirkland Lake, Ontario
New Hamburg, Ontario
Sudbury, Ontario
Kitchener, Ontario
Waterloo, Ontario
Matachewan, Ontario
Waterloo, Ontario
Waterloo, Ontario
Galt, Ontario
Galt, Ontario
Bay Ridges, Ontario
Downsview, Ontario
Fort Frances, Ontario
Fort William, Ontario
Guelph, Ontario
Elmira, Ontario
Kitchener, Ontario
Beamsville, Ontario
Hamilton, Ontario
Owen Sound, Ontario
Stouffville, Ontario
Kitchener, Ontario
Kitchener, Ontario
Meaford, Ontario
Preston, Ontario
Fort William, Ontario
Burlington, Ontario
Glencarin, Ontario
Uxbridge, Ontario
Kitchener, Ontario
Kitchener, Ontario
Downsview, Ontario
Sudbury, Ontario
Waterloo, Ontario

Science II
Arts I
Engineering II
Science III
Arts III
Engineering II
Arts III
Science II
Arts I
Science II
Engineering V
Arts I
Science II
Engineering III
Arts I
Science III
Arts II
Arts II
Arts I
Engineering II
Arts I
Engineering III
Science II
Engineering I
Science II
Engineering V
Engineering V
Arts I
Engineering II
Engineering II
Engineering II
Engineering V
Engineering III
Arts II
Engineering II
Science II
Science II
Arts I
Arts III
Engineering V
Engineering II
Arts II
Science II
Engineering V
Science I
University of Waterloo Special Proficiency Scholarships

Students ranking among the top one per cent of Ontario students, writing the annual Mathematical Association of America Contest, the Canadian Association of Physicists Contest, or other competitions of equivalent status conducted on a provincial or national scale are invited to apply for these Scholarships.

Awards will be made by the Scholarships Committee under the following general conditions:

(a) The amount of the scholarship shall be $3,000 ($600 in Year I, $800 in each of the three succeeding years), provided that, in the opinion of the awarding committee, the scholar maintains a sufficiently high academic standing.

(b) Selection from among the applicants shall be made by the committee in the light of achievement on the Ontario Grade XIII examinations. It is recommended that each applicant write the Ontario Grade XIII Problems paper, where applicable.

(c) Applicants must apply prior to June 1, on forms provided by the Office of the Registrar.

University of Waterloo First Year Scholarships

University of Waterloo First Year Scholarships are awarded annually to students entering the first year in any faculty, who have obtained an average of 75% in the nine Ontario Grade XIII papers required for admission to their particular faculty. The value of the First Year Scholarships will be the cost of tuition and incidental fees for one year.

Applicants who attain an average of 80% will automatically be considered for University Tuition Scholarships.

Application must be made prior to June 1, on forms provided by the Office of the Registrar.

The C. N. Weber Ltd. Scholarship

Undergraduates of any faculty of the University, who have completed at least two academic years, may apply for the C. N. Weber Ltd. Scholarship to the value of $1,000. Selection by the Scholarships Committee will be guided by the candidate's high academic achievement, financial need, and contribution to undergraduate activities. The successful candidate will normally receive $500 in each of the third and fourth academic years.

Application should be made through the Office of the Registrar at entry to third year.

The R. G. Stanton Scholarship in Mathematics and Physics

The R. G. Stanton Scholarship will be of an amount of $3600 ($600 in the first year of the course, and $1000 in each succeeding year), it is tenable so long as the student remains registered in the Mathematics option of the Mathematics and Physics course at the University of Waterloo, and maintains first-class honour standing in that course. The scholarship will be awarded to the candidate who, receiving an average of 75% on nine Ontario Grade XIII papers, obtains the highest average on the four Mathematics papers (Algebra, Geometry, Trigonometry, Problems). The candidate must have an average of 90% or better on these four papers to qualify.

In case the successful candidate qualifies for another University of Waterloo Scholarship, the amount of the R. G. Stanton Scholarship will be decreased by the amount of the other Scholarship.

If no award is made in any year, the amount may, at the discretion of the donor, be used to offer four scholarships of $900 ($300 in each of the second, third, and fourth years) to deserving students who have shown high ability in Mathematics.
Cyanamid Award
Cyanamid of Canada Ltd. offers a scholarship of $500 to a student entering third or fourth year in the Faculty of Science who has a high standing in all subjects in his or her previous year.

The successful candidate will be selected by the Scholarships Committee of the Faculty of Science. No application is necessary. A student holding a University of Waterloo National Scholarship is not eligible.

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

Association of Professional Engineers Undergraduate Scholarship
The Association of Professional Engineers of the Province of Ontario offers an annual scholarship of $250 to the student in an accredited engineering course who has the highest average in the examinations of his year.

Atkinson Charitable Foundation Bursaries
With the consent and approval of the Minister of Education for the Province of Ontario, a university bursary programme, sponsored by the Atkinson Charitable Foundation, became effective in June, 1953. Students with an average of at least 66% on eight papers of the Grade XIII examinations will be eligible for bursaries, provided they meet the admission requirements of the university concerned. Candidates must be residents of Ontario and be sponsored by their Secondary School principals. Final decision as to awards will be made by the university after investigation and assessment of applications. Bursaries will be granted to students of merit on the basis of $400.00 for students living away from home (in residence, or boarding while attending university), and $200.00 yearly for students residing within easy access to the university (where normal transportation costs do not exceed 75 cents daily). Applicants are free to select any course at one of the participating universities, provided such courses lead to a degree.

Atkinson Charitable Foundation "In Course" Bursaries
The Atkinson Charitable Foundation has established an “In Course” bursary programme in addition to the “Admission” bursary programme which the Foundation has supported since the 1953-54 academic year.

The “In Course” programme gives assistance to students of merit and proven financial need beyond the first year. Awards are made only to students who are bonafide residents of the Province of Ontario. Further information and application forms may be obtained from the Office of the Registrar.

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 Christmas customer gift-giving to bursaries for deserving 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 Scholarships Committee. Application for a bursary should be made through the Office of the Registrar.
IBM—Thomas J. Watson Memorial Bursaries

The University of Waterloo has been invited to participate annually in the IBM—Thomas J. Watson Memorial Bursary Programme, established by the International Business Machines Company Limited.

The objective of the programme is to provide financial assistance to undergraduate students in need 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 Scholarships Committee. Application may be made through the Office of the Registrar.

Dominion-Provincial Student-Aid Bursaries, Type A

Given by the Dominion and Provincial Governments, these bursaries have a maximum value of $250.00 to students attending university in the community in which they reside, and a maximum value of $500.00 to out-of-town students. They are intended for students of good character, whose health and physical fitness are satisfactory to the Committee of Award, who meet the required academic standing, and who, without financial assistance, could not continue their studies. To apply, the student should consult his Secondary School principal not later than June 30th.

Dominion-Provincial Student-Aid Bursaries, Type B.

These bursaries are given by the Dominion and Provincial Governments for students in any course who have attained at least 66% standing in their previous year's work, and who would find it impossible to continue their formal education without assistance. An applicant responsible for his own support shall have been a resident of Ontario for at least one year immediately prior to date of application. The parent or guardian of an applicant, other than an applicant responsible for his own support, shall have been a resident of Ontario for at least one year before the date of application. Application is to be made through the Office of the Registrar not later than October 8 for students beginning a new academic year in the Fall and by January 8 for students commencing in January.

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 Office of the Registrar.

University of Waterloo Student-Aid Fund

Beginning with the academic year 1961-62, students requiring financial assistance may apply for bursary aid through the University of Waterloo Student-Aid Fund. Awards will be made by the Scholarships Committee.

Application may be made at any time during the academic year on the forms provided by the Office of the Registrar.
Dominion Rubber Student Aid Plan

Beginning with the academic year 1961-62 the Dominion Rubber Co. Limited has included the University of Waterloo in its programme of aid to education. Awards will be made by the Scholarships Committee. A candidate must have completed at least two academic years, should establish a need for financial assistance and be willing to assume a moral obligation to repay to 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 Office of the Registrar.

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 electro-mechanical 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. Application for a bursary should be made to the Office of the Registrar.

The St. Quentin Chapter I.O.D.E. Bursary

The St. Quentin Chapter I.O.D.E., Waterloo offers an annual bursary of $100 to a second or third year student in the Faculty of Science, with preference being given to the son or daughter of a veteran.

Application should be made through the Office of the Registrar by October 15.

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.

Canadian German Society Scholarship in German

A scholarship of $100 will be awarded annually in the Faculty of Arts by the Canadian German Society to an outstanding student majoring in German.

Canadian German Business Association Scholarship in German

A $300 annual Scholarship will be awarded in the Faculty of Arts by the Canadian German Business Association of Toronto for students showing high proficiency and scholastic ability in German language and literature.

Association of Professional Engineers Gold Medal for Academic Achievement Award

The Association of Professional Engineers of the Province of Ontario makes this award to the student in the fourth year of an accredited engineering course, 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 $50.00

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 his 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.
The George Crabbe Prize for Creative Writing

This prize, open annually to all full-time students in all faculties, consists of $100 to be awarded, in whole or in part at the discretion of the judges, for superior creative writing in any of the following categories: short story, novelette, one-act play, full-length play, poetry. Contestants should submit their manuscript or manuscripts, typed double space and in duplicate, to the Office of the Registrar by October 31. Each manuscript shall bear a pseudonym and shall be accompanied by a sealed envelope containing the real name of the person using the pseudonym.

The Joseph Addison Essay Prize

This prize, open annually to all full-time students in all faculties, consists of $100 to be awarded, in whole or in part at the discretion of the judges, for the best essay or essays on one or more of a number of themes to be set each year. The themes for 1964 are the following:

(1) The effects of nationalism on literature.
(2) Changing fashions in iconography.
(3) The role of literature in the reform of manners.

Each essay, which may be no shorter than 2,000 words and no longer than 5,000, shall be on one of these themes, and should evince, in addition to a competent handling of the subject, the qualities of grace, clarity, and gentlemanly ease which characterize the essays of Joseph Addison. Contestants should submit their manuscript or manuscripts, typed double space and in duplicate, to the Office of the Registrar by January 31. Each manuscript must bear a pseudonym and must be accompanied by a sealed envelope containing the real name of the person using the pseudonym.

"Great Books of the Western World" Achievement Award

Two sets of "The Great Books of The Western World" will be offered annually by Encyclopedia Britannica of Canada Ltd., as prizes to one student graduating in each of the Faculties of Science and Engineering.

The award will be based on scholastic achievement in subjects dealing with the humanities and social sciences and also in regard to participation in the intellectual and cultural life of the academic community.

No application is required. Selection will be made by the Scholarship Committee.

R. A. Aziz Prize in Physics

This prize of $100 will be awarded annually to the student registered as a Physics major in the third year of the Honours Mathematics and Physics Course of the Faculty of Science who has obtained the highest First Class Honour Standing in the Second Year of that course.

The Bruce Wyler Kelley Memorial Prizes

These book prizes were established in 1960 by relatives and friends in memory of the late Bruce Wyler Kelley, the first Dean of Science at the University of Waterloo, 1958-1960. These prizes are awarded in the General Science Course at the end of the second year to two students, one registered with Botany as major subject and one registered with Chemistry as major subject. Qualifications are (a) a clear pass standing and (b) highest standing in Botany with a minimum of B standing, or highest standing in Chemistry courses taken with a minimum of B standing in the average of these courses.
Senior Physics Prizes
One or two Senior Physics prizes of $100 each will be awarded annually to the highest First Class Honour students registered in the Fourth Year Honours Physics or Applied Physics course.
On occasion, a Second Year prize may be awarded in lieu of one of the Senior Prizes.

Pennsylvania German Folklore Society of Ontario Prize in German
This prize of $50.00 will be awarded annually to the student in the Faculty of Arts, born in Canada, who has made the most progress in German during the year.

The Edgar W. McKegney Prize in Spanish
This prize of $100.00 will be awarded annually to a student proposing to enter an Honours Spanish course. The applicant must have attained a 75% average on nine Grade XIII papers required for admission as well as 75% in French and in Spanish. The prize may be renewed in subsequent years upon application.

Provincial Student-Aid Loans
An applicant for a loan shall be in good health and of good character and shall establish in his application by his own declaration and, if he is under 21 years of age, that of his parent or guardian, his need for financial assistance to complete his course of study for the academic year 1963-64. An applicant who is responsible for his own support shall have been a resident of Ontario for at least one year before the date of his application. The parent or guardian of an applicant other than an applicant responsible for his own support shall have been a resident of Ontario for at least one year before the date of the application. The maximum loan granted to any applicant for any one year shall ordinarily be $500.00. In general, the maximum loan outstanding to any student at any one time shall be $2,000.00, but additional amounts may be lent at the discretion of the Minister to students taking an undergraduate course of more than four years duration or to postgraduate students.
A successful applicant will be required to sign an undertaking to repay the loan with simple interest at four per cent per annum calculated from the first day of April in the year following his graduation or withdrawal from the eligible institution, the payments to be $25.00 a month beginning with the said first day of April, with the privilege of paying any additional amount at any time. Payments made on the account of a loan shall be applied first to any interest due on the loan.
Any student interested in obtaining such a loan is urged to contact the Office of the Registrar.

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 Office of the Registrar.

Transportation Assistance
The Provincial Government makes grants to students residing in territorial districts towards the cost of transportation between the university and the applicant's home. The assistance is payable only towards the cost of one round trip in any school year. Application should be made through the Office of the Registrar not later than November 1, for students commencing a new academic year in the Fall and by February 1, for students commencing in January.
GRADUATE SCHOLARSHIPS AND FELLOWSHIPS

University of Waterloo Teaching Fellowships

Various departments in the University offer Teaching Fellowships which allow a student to do elementary demonstrating, marking, and instruction while carrying on graduate work. These fellowships carry a stipend of $275 per month. Information concerning these departmental Fellowships may be obtained by applying directly to the department concerned or to the Dean of the Faculty of Graduate Studies.

NOTE: Some departments offer research assistantships which provide an opportunity for professional experience, and which may involve light instructional duties in addition to research. Applications for these must be filed by March 1.

National Research Council Postgraduate Scholarships and Postdoctorate Overseas Fellowships

The National Research Council awards each year, in open competition, a number of postgraduate scholarships in science and engineering to assist students in undertaking graduate study and research leading to advanced degrees, and a limited number of postdoctorate fellowships for those wishing to add to their experience by specialized training abroad. These scholarships are open to men and women on equal terms, and are awarded on the basis of high scholastic achievement and evidence of capacity to do research.

Applications made on the approved form must be filed not later than February 1.

The Queen Elizabeth II Ontario Scholarships

In honour of the visit of Her Majesty Queen Elizabeth II to Ontario in July, 1959, the Government of the Province has established a fund to provide annually a number of postgraduate awards to be known as "The Queen Elizabeth II Ontario Scholarships". In 1962, ten such scholarships, each of the value of $2,500 will be available in the fields of the humanities, social sciences, and mathematics.

Applications should be made prior to December 15, 1963.

Woodrow Wilson National Fellowship Foundation

The Woodrow Wilson National Fellowship Foundation offers 1,000 Fellowships annually for the first year of study in any qualified graduate school in the United States or Canada. The Foundation primarily supports candidates in the humanities and social sciences who wish to become college teachers.

A fellow receives $1,500 plus dependency allowances for wife and children, the Foundation also pays directly to the graduate school tuition and fees for the fellow.

A candidate must be nominated by a faculty member no later than October 31, 1963.

Imperial Oil Graduate Research Fellowships

Imperial Oil Limited in 1946 established for annual competition Graduate Research Fellowships, now five in number and having a potential value of $4,800 each ($1,600 a year for a maximum of three years). Each fellowship may be supplemented by an annual amount of $900 if the fellow continues his thesis work during the summer months. A fellow may not hold concurrently other awards which annually equal or exceed the value of the regular Imperial Oil payments ($1,600).

The fellowships are open to any graduate of an approved Canadian university and are offered for research leading to a Doctor's degree in the fields of Pure and Applied, Natural and/or Exact Sciences, including Mathematics (3 fellowships) and Social Sciences and Humanities (2 fellowships).

Nomination of students for the fellowships shall be made by the University not later than March 1 of each year.
Consolidated Mining and Smelting Company Graduate Research Fellowships

The Consolidated Mining and Smelting Company Limited offers ten Graduate Research Fellowships annually for the academic years 1962-1966 for award at Canadian universities. At least five of these awards will be made to graduates undertaking study and research leading to an advanced degree at Western Canadian Universities (West of Ontario).

The Fellowships will be of the value of $2,200 and open to any Canadian citizen who is a graduate in Pure Science, Applied Science, or Agriculture. A Fellowship will normally be tenable for one year, however, application for a renewal of the award may be made in succeeding years.

The subject of research investigation to be carried out under the Fellowship programme shall be in the field of Pure or Applied Science bearing some relationship to the technical interests of the Company, viz., Mining, Geology, Metallurgy, Chemistry, Chemical Engineering, Physics, Agriculture, and Electrical, Civil, and Mechanical Engineering.

Applications should be forwarded to the Secretary, Canadian Universities Foundation, not later than February 1 of each year.

Steel Company of Canada Graduate Research Fellowship in Metallurgy

The Steel Company of Canada Limited offers four fellowships for research in Metallurgy of the value of $2,000 each.

The competition for these fellowships is open to permanent residents of Canada who are graduates of a Canadian university. A fellowship will normally be tenable for one year, but in special circumstances may be renewed for a second year.

Applications should be forwarded to the Secretary, Canadian Universities Foundation, not later than February 28, 1963.

The Athlone Fellowships

Her Majesty’s Government in the United Kingdom has established a number of fellowships to be awarded annually to enable Canadian Engineering graduates to take postgraduate training in the United Kingdom. Additional fellowships are available for award to graduates who have already spent some time in industry. The fellowships, which are normally tenable for a period of two years, cover costs of transportation, fees and maintenance. Candidates must be Canadian citizens or British subjects normally resident in Canada and should preferably be less than twenty-seven years of age. Further information may be obtained from the Dean of the Faculty.

Commonwealth Scholarship and Fellowship Plan

The Commonwealth Scholarship and Fellowship Plan aims at providing opportunities for Commonwealth students to pursue advanced courses in other Commonwealth countries. The scholarships are intended for men and women of high intellectual promise who may be expected to make a significant contribution to their own countries on their return from study abroad. At present, graduate scholarships are available for study in the United Kingdom, Australia, New Zealand, Hong Kong, Malaya, Rhodesia and Nyasaland, Malta, India, Ceylon, East Africa, Nigeria and Pakistan, and the Canadian Government offers scholarships for other Commonwealth students to study in Canada. Awards will normally be made for a period of two academic years and will cover return transportation, tuition fees, a personal maintenance allowance, and a grant for incidental expenses. Deadline dates for receipt of applications vary according to each country. Full information and application forms may be obtained from the Canadian Commonwealth Scholarship Committee, 75 Albert Street, Ottawa 4, Ontario.
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Preston

Emmanuel J. Shoemaker
Kitchener

A. Melville Snider
Waterloo

Olcott W. Titus
Toronto

Carl N. Weber
Kitchener
THE SENATE

OFFICERS

Chairman—The President and Vice-Chancellor
Vice-Chairman—The Academic Vice-President
Secretary—The Registrar

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Chief Justice of Ontario
The Vice-Chancellor—J. G. Hagey, B.A., LL.D.
The Academic Vice-President—T. L. Batke, B.A.Sc., M.A.Sc., Ph.D.
The Principal of each Federated or Affiliated College
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W. Rees, B.A., M.A. (Principal, Renison College)
J. S. Fretz, B.A., M.A., Ph.D., B.D. (Principal, Conrad Grebel College)
D. J. Hall, B.A., S.T.M. (Principal, St. Paul's College)
The Dean of each Faculty of the University
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D. T. Wright, B.A.Sc., M.S., Ph.D. (Dean of Engineering)
W. A. E. McBryde, B.A., M.A., Ph.D. (Dean of Science)
R. G. Stanton, B.A., M.A., Ph.D. (Dean of Graduate Studies)
The Academic Dean of Each Federated College
The Librarian—(Mrs.) D. E. Lewis, B.A.
The Chairman of the Board of Governors—I. G. Needles, B.A.
The Registrar—A. P. Gordon, B.A.
The Director of Extension—G. Campbell, M.A.
ELECTIVE MEMBERS

Faculty Representatives

To 1963

J. W. Dyck, B.A., M.A., Ph.D. (Graduate Studies)
N. C. Lind, M.S., Ph.D. (Engineering)
J. C. McKegney, B.A., M.A., Ph.D. (Arts)
G. Power, B.Sc., Ph.D. (Science)

To 1964

F. W. Boswell, B.A., M.A., Ph.D. (Science)
W. B. Fallis, B.A.Sc., M.A.Sc., Ph.D. (Engineering)
K. D. Fryer, B.A., M.A., Ph.D. (Arts)
Z. T. Ralston, C.R., B.A., M.A., Ph.D. (St. Jerome’s College)
A. N. Sherbourne, B.Sc., B.S., M.S., M.A., Ph.D. (Engineering)

To 1965

W. H. Bexton, B.A., M.A., Ph.D. (Arts)
J. A. Cowan, B.Sc., M.A., Ph.D. (Science)
H. K. Kesavan, B.Sc., M.E., M.S., Ph.D. (Engineering)
B. J. Murphy, C.R., M.A., Ph.L. (St. Jerome’s College)
T. H. Qualter, B.A., Ph.D. (Arts)
D. A. Sprott, B.A., M.A., Ph.D. (Science)
R. G. Woolford, B.Sc., M.Sc., Ph.D. (Science)

High School Representatives

J. C. Herbert, B.A. (Ingersoll District Collegiate Institute)
R. J. Hodd, B.A. (Kitchener-Waterloo Collegiate & Vocational Institute)
F. M. Dobson, B.A. (Lakeport Secondary School)
W. M. Prudham, B.A., B.Sc. (Owen Sound Collegiate & Vocational Institute)
F. I. Crossley, B.A., B.Paed. (Pelham District High School)
A. I. Hunsberger, B.A., B.Paed. (Waterloo Collegiate Institute)

Alumni Representatives

B. Hayes, C.R., B.A. (St. Jerome’s College)
W. Klos, B.A. (St. Jerome’s College)
E. Lenko, B.A. (St. Jerome’s College)
OFFICERS OF ADMINISTRATION

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Vice-President, Academic - - T. L. Batke, B.A.Sc., M.A.Sc., Ph.D.
Vice-President, Finance - - - - - A. K. Adlington, B.A.
Assistant to the President - - - - - J. R. Scott, B.A., A.M.
Dean of Arts - - - - - N. H. High, B.S.A., M.S., Ph.D.
Dean of Engineering - - - - D. T. Wright, B.A.Sc., M.S., Ph.D.
Dean of Science - - - W. A. E. McBryde, B.A., M.A., Ph.D.
Dean of Graduate Studies - - R. G. Stanton, B.A., M.A., Ph.D.
Acting Dean of Women - - - (Mrs.) D. Walter, B.A., M.A.
Registrar - - - - - - A. P. Gordon, B.A.
Assistant Registrar, Admissions - - D. P. Robertson, B.Comm.
Assistant Registrar, Records - - - K. R. Hymmen, M.A.Sc.
Business Manager - - - - - A. B. Gellatly, B.A.
Librarian - - - - - (Mrs.) D. E. Lewis, B.A.
Director of Athletics - - - - - C. A. W. Totzke, B.A.
Director of Computing Centre - - - J. W. Graham, B.A., M.A.
Director of Co-ordination and Placement - - - - A. S. Barber, P.Eng.
Director of Development - - - - J. O. Hemphill
Director of Extension and Adult Education - - G. Campbell, M.A.
Director of Information Services - - - - J. D. Adams, B.A.
Director of Music - - - - - P. J. Berg
Director of Planning - - - E. M. Brookes, B.Sc., A.M.I.C.E.
Superintendent of Buildings and Grounds - - R. G. Titze, B.E.
ACADEMIC CALENDAR

1963-1964

June 20, 1963    Thursday    Meeting - Board of Governors
July 1           Monday     Last Day for Supplemental Examination Applications—Arts, Engineering and Science
July 2           Tuesday    Registration - Post Degree Programme
                       Lectures Begin - Post Degree Programme
July 6           Saturday   Meeting - University Senate
July 6           Saturday   Convocation
July 22          Monday     Supplemental Examinations Begin - Arts, Engineering and Science
August 2         Friday     Examinations End - Engineering
August 16        Friday     Spring Work Term Ends
August 19        Monday     Fall Work Term Begins
September 5      Thursday   Registration - Pre-Engineering and Year I, Engineering
September 6      Friday     Registration - Advanced Years - Engineering
September 9      Monday     Lectures Begin - Engineering - All Years
September 16     Monday     Registration - Year I, Arts and Year I, Science
September 17     Tuesday    Registration - Year II - Arts and Science
September 18     Wednesday  Registration - Years III and IV, Arts and Science
September 19     Thursday   Lectures begin - Arts and Science - All Years
October 17       Thursday   Meeting - Board of Governors
October 24       Thursday   Meeting - University Senate
October 25       Friday     Last Day for Supplemental Examination Applications—Engineering
November 13      Wednesday  Supplemental Examinations Begin - Engineering
December 19      Thursday   Meeting - University Senate
December 20      Friday     Examinations End - Engineering
December 20      Friday     Fall Work Term Ends
December 27      Friday     Supplementals - Post Degree Programme
December 30      Monday     Winter Work Term Begins
January 6, 1964  Monday     Registration - Engineering
January 6        Monday     Lectures Begin - Arts and Science
January 7        Tuesday    Lectures Begin - Engineering
January 16       Thursday   Meeting - Board of Governors
February 27      Thursday   Meeting - University Senate
March 2          Monday     Last Day for Supplemental Examination Applications—Engineering
March 18         Wednesday  Supplementals Begin - Engineering
April 16         Thursday   Meeting - Board of Governors
April 17         Friday     Winter Work Term Ends
April 18         Saturday   Examinations End - Engineering
April 20         Monday     Spring Work Term Begins
April 27         Monday     Registration - Engineering
April 28         Tuesday    Lectures Begin - Engineering
April 30         Thursday   Meeting - University Senate
May 23           Saturday   Convocation
June 19          Thursday   Meeting - Board of Governors
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