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# Graduate Calendar for the Academic Year 2011-2012

**Note:** This is an unofficial edition of the 2011-2012 Graduate Calendar regulations, programs and courses for internal use only. It does not contain late changes, corrections and updates. The most current edition including errata and late changes posted throughout the year can be found at [carleton.ca/cugc](http://carleton.ca/cugc) . The online (html) edition of the Graduate Calendar is the university's official statement.



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# General Regulations



## General Regulations

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### 1. Administration of the Regulations

#### 1.1 General Administration

The following regulations apply to all degree, diploma and graduate certificate programs administered by the Faculty of Graduate and Postdoctoral Affairs.

#### 1.2 Student Responsibility

(i) It is the student's responsibility to remain informed of all rules, regulations and procedures required by their program and by the Faculty of Graduate and Postdoctoral Affairs. Ignorance of regulations will not be accepted as a justification for waiving such regulations and procedures.

Any exceptions to the rules, regulations and procedures must be approved in writing by the Dean of the Faculty of Graduate and Postdoctoral Affairs.

Students are responsible for establishing and maintaining contact with their departmental graduate supervisor/associate chair (graduate affairs) and, if appropriate, thesis/research supervisor.

(ii) To receive their degree or graduate diploma students must fulfill:

- all the requirements of the department, school, or institute in which he or she is registered, including completion of an application for graduation;
- all regulations of the Faculty of Graduate and Postdoctoral Affairs;
- all University regulations;
- all financial obligations to the University.

### 2. Admission Requirements and Eligibility

#### 2.1 General Requirements

Graduates of recognized universities will be considered for admission to the Faculty of Graduate and Postdoctoral Affairs. The University's general policy on admission is outlined below, but all applicants should refer to the departmental websites for details concerning the specific or additional requirements of each department, institute, or school.

#### 2.2 Eligibility

The eligibility of a candidate for admission into one of the graduate programs is based upon:

- the performance of the candidate and the assessment provided by his/her referees as a measure of the likelihood that the candidate can successfully complete the course of study and research defined by the Senate of the University for the given degree;
- the capacity of the graduate department, institute, or school to provide a program of study and research that would meet the expectations of the candidate as defined in his/her statement of academic interests and ambitions;
- the availability of a faculty member competent to supervise the candidate's academic program of study and research.

#### 2.3 Qualifying-Year Program

Applicants who do not qualify for direct admission to the master's program may be admitted to a qualifying-year program. Applicants who lack a four-year honours degree but have a three-year degree with honours standing (at least B overall) will normally be admitted to a qualifying-year program.

Admission to the qualifying-year program does not imply automatic admission to the master's program. At the end of the qualifying-year program the student will be required to apply for entry into the master's program, at which time the department will determine the student's eligibility to enter the program. If successful, the student will be informed of this decision by the Dean of the Faculty of Graduate and Postdoctoral Affairs.

Applicants who require 3.0 credits or more of additional requirements to enter the master's program must complete a qualifying year.

Credits taken to fulfill the requirements of the qualifying-year program may not be used for credit for the master's degree. Courses taken extra to the program requirements of the qualifying year and which have been successfully completed may be considered for credit towards the master's degree.

#### 2.4 Master's Program

For admission to the master's program, applicants must hold an honours bachelor's degree, or the equivalent, with at least high honours standing (normally B+ or better in the honours subject; B- or better overall). Applicants must also be recommended by the department in which they plan to undertake their studies.

#### 2.5 Doctoral Program

For admission to the Ph.D. program, applicants must ordinarily hold a master's degree, or the equivalent, from a recognized university, normally with an average of B+ or better in courses (including thesis where applicable) and normally with no grade below B-.

## 2.6 Restriction on Degrees

Carleton University does not restrict the number of degrees (bachelor's, master's, Ph.D.) that may be taken in any one discipline at Carleton University, but some departments, institutes or schools may restrict the number to two.

## 2.7 Graduate Certificate Programs

For admission to the certificate programs, applicants are advised to consult with the individual departments, institutes or school offering the certificate.

## 3. Application for Admission

### 3.1 Accommodation Policy for Students with Disabilities

Carleton University has a Senate-approved policy on academic accommodation for students with disabilities. For more information, consult the Paul Menton Centre for Students with Disabilities at <http://www2.carleton.ca/pmc>

### 3.2 Application Forms

Applications for admission to the Faculty of Graduate and Postdoctoral Affairs should be made through the online applications available at <https://gsapplications.carleton.ca>

To cover administrative costs, a non-refundable application fee (CDN or US funds) is required with each application.

### 3.3 Deadlines

Normally, students are admitted to commence study in the fall term. However, some departments, institutes or schools may consider applicants to commence in the winter term or the spring/summer term. Applications for admission from outside Canada by individuals who are not Canadian citizens or permanent residents of Canada should be completed at least six months before the desired date of admission in order for applicants to make the necessary visa arrangements.

For information on the specific deadlines for applications (with or without financial assistance), please visit the online application site by selecting the "Online Application Account" link from the Faculty of Graduate and Postdoctoral Affairs website at <https://gsapplications.carleton.ca>. In the online application site, application deadlines can be found on the left-hand navigation panel under "Program Deadlines."

Students applying to joint programs with the University of Ottawa should note that application procedures, especially deadlines, are different in the two institutions, and they should contact the individual institution for information.

### 3.4 Transcripts

Two detailed official transcripts of the applicant's entire university record must be sent to the appropriate department, institute, school or program. All foreign documents, e.g., transcripts, must be translated into English and be notarized.

### 3.5 Letters of Reference

All applications must be supported by letters of recommendation from at least two faculty members with whom the candidate has studied, who are in a position to assess his/her potential for graduate studies. References from non-academic supervisors are not ordinarily acceptable, except in certain cases, such as that of an applicant working in a research laboratory environment. All letters of reference are to be sent by the referees directly to the department, institute, school or program.

## 3.6 Proficiency in English

Proficiency in English is necessary to pursue graduate studies at Carleton University. All applicants whose first language is not English must satisfy this requirement in one of the following ways:

- to present an official overall score of 70 on the Canadian Academic English Language (CAEL) Assessment; or
- to present an official Test of English as a Foreign Language (TOEFL) score of 580 on the paper-based test (PBT), or an overall score of 86 on the internet-based test (IBT) with a minimum score in each component of: writing-22; speaking-22; reading-20; and listening-20; or
- to present an official overall International English Language Testing System (IELTS) score of 6.5, with a minimum of 6.0 in each band score; or
- to have completed ESLA 1900 or ESLA 1905 at Carleton University with a final grade of B- or higher; or
- to present acceptable certification that the language of instruction in their most recently completed undergraduate or graduate degree was English.

Note that some programs demand higher levels of competence in English, as specified in their Admissions Requirements in this Calendar.

Applicants whose first language is not English and who do not meet the requirements stated above may be offered admission to a graduate degree program with an English as a Second Language Requirement (ESLR) and/or will be required to take prescribed remedial course work as a condition of continuing in their program.

## 4. Admissions Procedure

### 4.1 General Procedure

All applicants for admission will be examined and evaluated by the department, institute, school or program in which the applicant wishes to study. All supporting documents (transcripts, letters of reference, etc.) must be received before any application can receive formal consideration.

Recommendations for admission will be forwarded to the Dean of the Faculty of Graduate and Postdoctoral Affairs for consideration. The official notice of acceptance comes from the Dean of the Faculty of Graduate and Postdoctoral Affairs. Any correspondence from departments, institutes, schools or programs with regard to acceptance is not official.

### 4.2 Admission Validity for New Students

The Statement of Standing on Admission issued to newly-admitted student is valid **only** for the term stipulated on the form. If the applicant fails to register for this term, his/her admission and registration eligibility will lapse automatically and he/she must re-apply for admission.

### 4.3 Revocation of Admission or Registration

Applications for admission or registration will be revoked if the University determines that the applicant has provided incomplete or misleading information.



## 5. Program Requirements

### 5.1 General Information

Program Descriptions and Details of Courses can be found in subsequent sections of this Calendar. Prospective applicants should note particularly the admission requirements, the fields in which advanced study and research may be undertaken, and the program requirements, in addition to the general regulations of the Faculty of Graduate and Postdoctoral Affairs, which are detailed in this section.

### 5.2 Qualifying-Year Program

Students in the qualifying year will ordinarily register in 5.0 credits at the senior undergraduate level. Of these 5.0 credits, normally no more than 1.0 credit at the 2000-level and no more than 2.0 credits at the 5000-level may be taken. Credits taken to fulfill the requirements of the qualifying-year program may not be used for credit towards the master's degree.

### 5.3 Master's Program

The normal requirement for the master's degree is 5.0 credits, of which at least 4.0 (including the thesis where applicable) must be at the 5000-level. With program approval, the remaining 1.0 credit may be selected from those offered at the senior undergraduate level, that is, at the 4000-level.

In the case of a 10.0-credit master's degree, at least 8.0 credits (including the thesis where applicable) must be at the 5000-level. With program approval, the remaining 2.0 credits may be selected from those offered at the senior undergraduate level, that is, at the 4000-level.

In the case of a master's degree in the range of 7.0-9.0 credits, 1.0 credit may be selected from those offered at the senior undergraduate level, that is, at the 4000-level, with the approval of the program.

### 5.4 Doctoral Program

Ordinarily, all courses taken for credit towards the Ph.D. degree must be at the 5000- or 6000-level.

The thesis will ordinarily carry a weight of about half of the total requirement of 10.0 credits.

### 5.5 Language Requirements

Some graduate programs require a reading knowledge of one or more languages other than English. Language requirements will be prescribed by programs according to their regulations and the needs of their students. Language requirements must be completed within the time limit allowed for the completion of the student's program.

## 6. Transfer of Credit

### 6.1 Transfer of Credit on Admission

Graduate courses completed at another institution or at Carleton University that have not been used to fulfill the requirements of another degree program may be accepted in partial fulfillment of Carleton's degree requirements. Credit for such work will be determined in each case by the Faculty of Graduate and Postdoctoral Affairs on the recommendation of the program concerned. Master's candidates in a 5.0-credit program are allowed a maximum of 2.0 transferred credits. In addition, if a master's candidate is granted transfer of credit for 2.0 credits, his/her remaining 3.0 credits at Carleton must be at the 5000-level.

Master's candidates enrolled in programs other than 5.0 credits will be permitted to transfer the equivalent of up to 40 per cent of their program credit requirements on admission. In addition, if a master's candidate is granted transfer of credit for 40 per cent of their program credit requirements, his/her remaining credits at Carleton must be at the 5000-level.

Doctoral candidates may be given advanced standing for work completed at other universities, but must normally register for a minimum of one year of full-time studies thereafter at Carleton and fulfill the thesis and comprehensive examination requirements. Students admitted with transfer of credits in a Ph.D. program may be required to pass a qualifying examination upon entry.

A candidate who has completed credits as a special student will only be permitted to transfer such credits for degree credit in the Faculty of Graduate and Postdoctoral Affairs with the permission of the Dean.

Special students enrolled in a graduate level course are subject to the special student regulations outlined in the Undergraduate Calendar at <http://www.carleton.ca/calendars/ugrad/current>

### 6.2 Transfer of Credit After Admission

A student admitted to and eligible to register in a graduate program is not permitted to register at Carleton University at the same time in any other graduate program or as an undergraduate or special student.

## 7. Registration and Course Selection

### 7.1 The Calendar Year

The Faculty of Graduate and Postdoctoral Affairs divides the calendar year into three terms; each term comprises about thirteen weeks of lectures or seminars. The first term of the academic year is designated as the fall term; the second term of the academic year is designated as the winter term; and the third term of the calendar year is designated as the spring/summer term. The precise dates of registration for the fall, winter, and spring/summer terms are specified in the Academic Schedule section of this Calendar.

### 7.2 Course/Program Approval

Initial course/program registration and any subsequent course changes must be approved by the program's graduate supervisor/associate chair (graduate affairs). This approval is also required for any undergraduate student who wishes to register in a graduate-level course.

Credit will be granted only for those courses and research activities for which the candidate is formally registered. An unregistered student is not entitled to attend lectures, tutorials, or seminars, and is not entitled to thesis supervision, examination privileges, or access to research facilities. Students will receive no credit for any work completed during a term in which they were not registered.

### 7.3 Student Records Information

#### Names

The University is committed to the integrity of its student records. Students are required to provide on their application for admission their complete legal name. Any requests to change a name, by means of alteration, deletion, substitution, or addition,

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must be accompanied by appropriate supporting documentation. Upon making application for graduation, students may be asked to provide proof of their name.

### Addresses

Incorrect address information will delay the receipt of awards and student information. Students must update the following address information at <https://central.carleton.ca> permanent or mailing address (used for registration information):

- mailing address (used for all mail during the academic session)
- telephone number for permanent address and for mailing address

### Disclosure of Information

The Ministry of Training, Colleges and Universities, and Statistics Canada require that Carleton University provide information pertaining to a student's status and other personal information. Upon registration, the student is deemed to have agreed to the disclosure by Carleton University of their status and other selected personal information pursuant to any such requirement.

In accordance with the Freedom of Information and Protection of Privacy Act (FIPPA), all personal and academic information is considered confidential and will not be disclosed to a third party without the authorization of the person to whom the information pertains. In addition, the University will disclose at the time of collection of personal information the purpose for which that information will be used. For further information, please see [carleton.ca/privacy/fippa-at-carleton-university](http://carleton.ca/privacy/fippa-at-carleton-university)

### Electronic Communication

The University uses electronic mail communication through its MyCarleton (Connect) system as an official channel of communication with students. A message sent to a student's MyCarleton e-mail account constitutes an official communication with the student. Students are responsible for monitoring their University e-mail account on a regular basis for as long as they are active in the academic affairs of the University. Requests from students regarding academic or administrative issues must be sent from the student's MyCarleton (Connect) account.

### 7.4 Course Selection

Students proceeding to a graduate degree, diploma, or certificate must arrange their program according to the regulations of the Faculty of Graduate and Postdoctoral Affairs and their program.

The course and thesis requirements of each graduate program are organized or defined in units of credits: 1.0 credit is typically made up of three hours of lectures or seminars a week for two terms, or the equivalent; 0.5 credit is typically made up of three hours of lectures or seminars a week for one term, or the equivalent; 0.25 credit is typically made up of three hours of lectures or seminars a week for six weeks, or the equivalent.

### 7.5 Evaluation

To gain standing in a course, a student must meet the course requirements for attendance, term work, and examinations. Instructors will inform their classes by distributing written notices, before the last day for late registration, of the elements and their weighting that will contribute to the final grade, including (where applicable) attendance, class participation, essays, tests, laboratories, studio-workshops, other course-related work assignments, and final examinations.

### 7.6 Tutorial or Reading Courses

Tutorial or Reading Courses are arranged to allow students to take full advantage of all the resources of the University in areas or fields of a very highly specialized nature. Such arrangements are subject to the approval of the departmental graduate supervisor/associate chair (graduate affairs).

### 7.7 Audit Course

Graduate students must have approval from the course instructor and their program graduate supervisor/associate chair (graduate affairs) to audit a course. Course audit registration is limited to a maximum of 1.0 credit per program.

- Full-time students are not charged an additional fee.
- Part-time students may only take 1.25 credits per term. They may only register in 0.5 credit if they audit a 0.5 credit course.

### 7.8 Course Numbering System

Each course is designated by an eight-character alphanumeric code. The first four letters indicate the department, institute, school or committee under whose auspices the course is offered. The four numerical digits identify the specific course. The credit value is indicated in square brackets following the course number.

### 7.9 Status

Full- or part-time status is established at the time of admission to a program. Graduate students admitted and registered as full-time students will be required to continue in and complete their program as full-time students, and will be assessed full-time fees for the duration of their program. Graduate students admitted and registered as part-time students will be required to continue and complete their program as part-time students, and will be assessed part-time fees for the duration of their program.

A part-time graduate student will not register in more than 1.25 credits per term, including audit courses.

Students who are unsure of their status should contact the office of the Faculty of Graduate and Postdoctoral Affairs for assistance at 613-520-2525.

### 7.10 Change of Status from Full- Time to Part-Time

Students who have valid reasons for changing status from full-time to part-time prior to registration for a term may apply for permission by:

- writing to the Dean of the Faculty of Graduate and Postdoctoral Affairs stating the reason(s) for seeking exemption from the full-time registration requirements stated in 7.9
- by completing a Change of Registration Status Form, accompanied by a statement from the departmental graduate supervisor/associate chair (graduate affairs) – and the thesis supervisor, if applicable – in support of their request.

It is understood that such a status change will be granted only in exceptional cases (e.g., for medical reasons.)

Exemptions are normally granted for a term.

### 7.11 Off-Campus Research

Graduate students may arrange to undertake full-time studies or research at another institution or in the field. Such activity may apply to only a part of the total program. The off-campus period may not normally exceed twelve months.

Requests for permission to undertake full-time off-campus study or research must be submitted to the Dean of the Faculty of Graduate and Postdoctoral Affairs with the approval of the department graduate supervisor/associate chair (graduate affairs). Such requests should include the following information:

- a detailed statement of the research proposal or program of studies, and the specific arrangements that are proposed for the supervision and direction of the work;
- an explanation of the reasons why the work cannot be satisfactorily undertaken while on campus at Carleton University;
- a description of the studies and/or research facilities that are available at the proposed off-campus location;
- a written statement from a responsible official (for example, the on-site supervisor or director) of the external institution confirming that the proposed arrangements are satisfactory and that the candidate will be able to undertake research or studies;
- a time schedule for the proposed studies or research work;
- a statement of the candidate's expected sources of financial support.

Once the Faculty of Graduate and Postdoctoral Affairs grants approval, the student is expected to register prior to departure.

#### 7.12 Cotutelle

Doctoral students may arrange to undertake a cotutelle in which they will complete the requirements of a Ph.D. program in both their home university and a partner university in another country.

Under such an arrangement, doctoral students conduct their dissertation research collaboratively, sequentially, and for roughly equal amounts of time in both universities. They are supervised in their dissertation research by a faculty member from each of the universities. The dissertation is then examined by a committee whose members are drawn from both institutions.

Students who undertake a cotutelle are not subject to general regulation 7.11.

Requests for permission to undertake a cotutelle must be made in accordance with Carleton University's Cotutelle Policy. For more information regarding cotutelle, please view the official Carleton University Cotutelle Policy at [carleton.ca/secretariat/policies](http://carleton.ca/secretariat/policies)

#### 7.13 Inter-University Cooperation in Graduate Instruction

Under certain circumstances, it is permissible for a student admitted to a graduate degree program and registered at one university to follow an approved graduate-level credit course at another university. All interested students should consult the chair/director of their department, institute or school prior to registration in order to obtain further information on procedures and conditions of eligibility. In order for this procedure to be valid, students must be officially registered at their home institution.

#### 7.14 University of Ottawa

Carleton University and the University of Ottawa have developed a number of joint programs at the graduate level. Where formal joint programs do not exist, a graduate student may be permitted to follow up to 2.0 credits at the 5000- or 6000-level at the University of Ottawa. Reciprocal arrangements

exist among departments, institutes and schools at both universities. All interested students should consult their program graduate supervisor/associate chair (graduate affairs), prior to registration, in order to obtain further information on particular departmental conditions of eligibility and procedures. Students must be officially registered at their home institution.

## 8. Continuous Registration

### 8.1 Loss of Status

Any student who remains unregistered in his/her degree program for three continuous terms (twelve months) will lose his/her graduate status.

### 8.2 Continuous Registration in Thesis, Research Essay, or Independent Research Project

Any student (full-time or part-time), after initial registration in a thesis, research essay or independent research project, must maintain this registration in all successive terms (including the term in which the student is examined) until his/her thesis, research essay or independent research project is completed. Completion means submission of a final grade to the Faculty of Graduate and Postdoctoral Affairs after modifications/revisions. Students should note that approval to register in the thesis, etc, is given on the understanding that the student will be in regular contact with his/her supervisor, and that thesis research will be actively pursued in each term of registration.

### 8.3 Deposit of Thesis Copies

In the case of a thesis, registration must be maintained until two final copies are deposited in the office of the Faculty of Graduate and Postdoctoral Affairs. Should the final copies not be deposited in the office of the Faculty of Graduate and Postdoctoral Affairs by the last day for late registration in a given term, the student will be required to register for that term.

### 8.4 Reinstatement

Students whose files have been closed as a result of failure to observe continuous registration requirements; or have lost their status for non registration for three continuous terms, must apply for reinstatement if they wish to continue their studies. If reinstated, students must pay a reinstatement charge plus the equivalent of 1.0 credit tuition fees for each term in which they failed to register, as well as for the current term of registration.

### 8.5 Exemption from Registration

Students who have valid reasons for not registering for a term may apply for permission to remain unregistered by:

- writing to the Dean of the Faculty of Graduate and Postdoctoral Affairs prior to the registration period stating the reasons for seeking exemption from registration;
- by completing an Exemption from Registration form accompanied by a statement from the program graduate supervisor/associate chair (graduate affairs) – and from their thesis supervisor, if applicable – confirming that they will not be on campus for the term, will not use any University facilities (that is, library, laboratories, computer centre, etc.), or receive any supervision, including supervision through correspondence;
- While exempt from registration, students will not be registered with the Faculty of Graduate and Postdoctoral Affairs, neither will they be required to pay fees for this period. They will not be eligible to receive awards administered by Carleton



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University. In the case of external awards, the regulations of the particular granting agency will apply.

It is understood that such an exemption from registration will be granted only in exceptional cases (for example, medical reasons).

Exemptions are normally granted for one term.

When exemption from registration for a term or terms has been approved by the Dean of the Faculty of Graduate and Postdoctoral Affairs, this period will be exempt from the overall time limit for completion of the program.

An administrative fee per term for an exemption will be charged to the student's account.

**8.6 Off-Campus Registration**

Students who have been permitted to study off campus while registered full-time at Carleton must register using Carleton Central Web Registration at [carleton.ca/ccs/services/web-services/web-server-registration](http://carleton.ca/ccs/services/web-services/web-server-registration)

**8.7 Course Changes**

A course change is defined as the addition or deletion of one or more individual courses by a registered graduate student. This is the acceptable procedure for revising or correcting a graduate student's registration. Some course changes must be approved by the student's program graduate supervisor/associate chair (graduate affairs).

The deadline dates for course changes are stipulated in the academic schedule of this Calendar.

**8.8 Withdrawal**

Graduate students wishing to terminate their registration in a graduate program (that is, drop all courses) must notify their department in writing of their intent to withdraw.

**Withdrawal Credit**

When a student officially withdraws, a full refund will be issued if notification is received within the refund period. Students are encouraged to examine the financial and award implications of withdrawal. Refund deadline information is available at the Business Office and online at [carleton.ca/fees](http://carleton.ca/fees)

**Mid-Term Transfer of Program**

There is no procedure at Carleton University for direct "mid-term" transfer from one graduate program to another. Similarly, there can be no direct transfer to or from undergraduate or special student status. Any candidate who elects to change programs after registration (before the last day of late registration) will be required to withdraw from the first program and then register in the second.

**9. Examinations**

**9.1 General Remarks**

Final examinations in courses will be held at the times indicated in the academic schedule. Graduate students must obtain grades that meet the standards outlined in Section 11, Academic Standing, and that satisfy the specific requirements of the program concerned.

**9.2 Special/Deferred Final Examinations**

A graduate student who is unable to write a final examination because of illness or other circumstances beyond their control, or whose

performance on the examination has been impaired by such circumstances, may apply to write a special or deferred final examination. Such an application is only necessary if the examination falls beyond the period that an incomplete grade is assigned and will be considered only if it is submitted in writing to the Dean of the Faculty of Graduate and Postdoctoral Affairs within two weeks of the examination.

Appropriate documents will be required.

Students with special needs should follow Paul Menton Centre guidelines at <http://www2.carleton.ca/pmc>

**9.3 Master's Examinations**

In addition to any examination which may be required in individual courses, or comprehensive examinations in required fields of specialisation, a master's candidate who is writing a thesis will be expected to undertake an oral defence of the thesis. When the degree is taken by course work, a comprehensive examination may be required. It is important to note that individual programs may have specific requirements.

**9.4 Doctoral Examinations**

Doctoral candidates may be asked to pass a qualifying examination at the beginning of their residency at Carleton University.

A comprehensive examination covering prescribed fields will normally be undertaken at least one year prior to the thesis defence. This examination (oral or written, or both) may include any material considered fundamental to a proper comprehension of the field of study.

After the thesis has been received and accepted for examination, a final oral examination on the subject of the thesis and related fields will be held.

The thesis examination must be conducted according to the principles and practices prescribed by the Faculty of Graduate and Postdoctoral Affairs [www.carleton.ca/fgpa/ccms/wp-content/ccms-files/Thesis-Examination-Policy.pdf](http://www.carleton.ca/fgpa/ccms/wp-content/ccms-files/Thesis-Examination-Policy.pdf).

**9.5 Unsatisfactory Comprehensive Grades**

If the comprehensive examination is graded Unsatisfactory, the program may permit the candidate to repeat the examination. If the comprehensive examination is graded Unsatisfactory for a second time, students must make an appeal to remain in their program through their program graduate supervisor/associate chair (graduate affairs) to the Faculty of Graduate and Postdoctoral Affairs.

**10. Grading System**

**10.1 Letter Grades**

Carleton University employs the twelve-point system of letter grades to represent standing in graduate lecture courses, directed studies, seminars, tutorials, and some research essays. The letter grades used and the grade point equivalents are:

A+	12	B+	9
A	11	B	8
A-	10	B-	7
C+	6	D+	3
C	5	D	2
C-	4	D-	1

The following percentage equivalents apply to all final grades at Carleton:

A+	90-100	B+	77-79
A	85-89	B	73-76
A-	80-84	B-	70-72
C+	67-69	D+	57-59
C	63-66	D	53-56
C-	60-62	D-	50-52

## 10.2 Other Grading Notations

Under certain defined circumstances, notations are used instead of letter grades to represent standing. The only notations permissible in the Faculty of Graduate and Postdoctoral Affairs are the following:

- Satisfactory or Unsatisfactory may be assigned, subject to the approval of the Faculty of Graduate and Postdoctoral Affairs, in courses involving practicum, field work, or other complex activities not easily adaptable to the twelve-point system of grading;
- comprehensive examinations are graded Pass With Distinction, Satisfactory, or Unsatisfactory;
- the master's thesis is graded Pass With Distinction, Satisfactory, or Unsatisfactory. The oral defence is graded Satisfactory or Unsatisfactory;
- the Ph.D. thesis and its oral defence are each graded Satisfactory or Unsatisfactory;
- Incomplete may be assigned to a course in which the student has been approved to submit an assignment after the final deadline date. Incomplete must be replaced with a letter grade within forty days of the end of classes. If the Incomplete is not changed to a letter grade within forty days of the end of classes, the Incomplete will be changed to a grade of F, which will remain as a permanent entry on the student's record. In exceptional cases students may petition the Dean of the Faculty of Graduate and Postdoctoral Affairs to have the Incomplete remain on the student record. For circumstances that go beyond the forty-day period (i.e. medical), students may apply for a deferral (refer to Special/Deferred Final Examinations, Section 9.2);
- Fail: F will be assigned to any course in which the student has failed;
- Absent will be assigned to any course in which the student failed to attend the final examination. Students may explain their absence (in writing) to the departmental graduate supervisor/associate chair (graduate affairs) within fourteen days of that examination to request a special or deferred examination;
- Absent may also be assigned where a student has not withdrawn from the course prior to the end of classes; this notation is deemed the equivalent of a failure;
- If a thesis, research essay, independent research project or comprehensive examination is not completed by the end of the period of registration, the notation of In Progress will be recorded. In Progress may, subject to the approval of the Faculty of Graduate and Postdoctoral Affairs,

be used for a research seminar, i.e., a seminar in which students present the results of their thesis research. In Progress must be replaced by an appropriate final notation or grade (as specified above) after the thesis, research essay, independent research project or research seminar has been examined. In cases where a student has registered in a research essay or a thesis without completing it and later undertakes course work to complete the degree program, or loses graduate student status in the program, the notation In Progress will remain as a permanent entry on the student's record.

## 10.3 Release of Grades

Students may access grades through the Carleton Central Student registration system at [carleton.ca/registrar/registration](http://carleton.ca/registrar/registration) as soon as the grades are available after the end of the fall and winter terms of the fall/winter session and after the end of the spring/summer session.

## 10.4 Transcripts

Students are advised that no official transcripts will be released by the University until all outstanding accounts have been paid.

## 11. Academic Standing

### 11.1 Qualifying-Year Program

Students should note that admission to the master's program from qualifying year is governed by the admission requirements in Section 2, Admission Requirements and Eligibility.

### 11.2 Master's Program

A grade of B- or better must normally be obtained in each course credited towards the master's degree. A candidate may, with the support of the departmental graduate supervisor/associate chair (graduate affairs) and the approval of the Dean of the Faculty of Graduate and Postdoctoral Affairs, be allowed a grade of C+ in 1.0 credit. Some programs do not permit the C+ option and apply a B- minimum rule.

### Full-Time Continuation

Full-time master's students who fail to achieve a weighted GPA of 7.0 after two terms of study, or to maintain it subsequently, will be required to withdraw from the program. In the event of special or extenuating circumstances, the student may apply through the program graduate supervisor/associate chair (graduate affairs) to the Dean of the Faculty of Graduate and Postdoctoral Affairs for permission to continue in the program.

### Part-Time Continuation

Part-time master's students who fail to achieve or maintain a weighted GPA of 7.0 after completing 2.0 credits, or to maintain it subsequently, will be required to withdraw from the program. In the event of special or extenuating circumstances, the student may apply through the program graduate supervisor/associate chair (graduate affairs) to the Dean of the Faculty of Graduate and Postdoctoral Affairs for permission to continue in the program.

### 11.3 Doctoral Program

Doctoral students must obtain a grade of B- or better in each course credited towards the degree.

### 11.4 Departmental Evaluation

In addition to the above requirements, departments will undertake a periodic evaluation of a student's progress in his or her overall program to determine whether that progress is satisfactory. In the event that progress is deemed unsatisfactory, the program

graduate supervisor may recommend to the Dean of the Faculty of Graduate and Postdoctoral Affairs that the student be required to withdraw.

### 11.5 Religious Accommodation

Carleton University accommodates students who, by reason of religious obligation, must miss an examination, test, assignment deadline, laboratory, or other compulsory event.

Accommodation will be worked out directly and on an individual basis between the student and the instructor(s) involved. Students should make a formal request to the instructor(s) in writing for alternative dates and/or means of satisfying requirements. Such requests should be made during the first two weeks of any given academic term, or as soon as possible after a need for accommodation is known to exist. Instructors will make reasonable accommodation in a way that shall avoid academic disadvantage to the student.

Students unable to reach a satisfactory arrangement with their instructor(s) should contact the Office of Equity Services at <http://www2.carleton.ca/equity/>.

Instructors who have questions or wish to verify the nature of the religious event or practice involved should also contact this office.

## 12. Thesis Requirements

Guidelines for the preparation of graduate theses [[carleton.ca/fgpa/thesis/thesis-preparation-guidelines/](http://carleton.ca/fgpa/thesis/thesis-preparation-guidelines/)] and information on the procedures for examination of graduate theses [[carleton.ca/fgpa/ccms/wp-content/ccms-files/Thesis-Examination-Policy.pdf](http://carleton.ca/fgpa/ccms/wp-content/ccms-files/Thesis-Examination-Policy.pdf)] are available on the Faculty of Graduate and Postdoctoral Affairs website.

### 12.1 General Remarks

The thesis is a major requirement of many master's and all doctoral programs and, in conjunction with the research for it, makes up at least one half of the time normally required for the program. The thesis must be expressed in a satisfactory literary form, consistent with the discipline concerned, and must display a scholarly approach to the subject and thorough knowledge of it. A critical review of previous work related to the subject should usually be provided.

Students will not be permitted to submit a thesis for which they have previously received a degree; however, with the permission of the Dean of the Faculty of Graduate and Postdoctoral Affairs, they may incorporate into the thesis material that was included in a previous thesis.

### 12.2 Master's Thesis

The master's thesis should exhibit a competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting. On the basis of that conceptual understanding and methodological competence, it should demonstrate at least one of the following a) the development and support of a sustained argument in written form or b) originality in the application of knowledge.

#### Oral Examinations

Students are required to undertake an oral examination of the thesis. Please refer to Thesis Specifications, Section 12.5, Master's, for submission deadlines. The master's thesis will be examined by a board consisting of at least four members, including the thesis supervisor, the chair of the department concerned, an examiner from a department other than that of the candidate, and one additional member from the department concerned. The chair of the

department concerned will announce the constitution of the examination board. See Thesis Examination Policy at [[www.carleton.ca/fgpa/ccms/wp-content/ccms-files/Thesis-Examination-Policy.pdf](http://www.carleton.ca/fgpa/ccms/wp-content/ccms-files/Thesis-Examination-Policy.pdf)].

#### Thesis Weight

Thesis weight must be identified at the time of admission. A change in the thesis weight at a later date requires the approval of the Dean of the Faculty of Graduate and Postdoctoral Affairs.

### 12.3 Doctoral Thesis

The doctoral dissertation must report, in an organized and scholarly fashion, the results of original research. The thesis must be a contribution to knowledge, and must demonstrate the ability to conceptualize, design and implement research for the generation of new knowledge, applications, or understanding at the forefront of the discipline, and to adjust the research design or methodology in the light of unforeseen problems.

#### Oral Examinations

The thesis must be defended successfully at an oral examination. Please refer to Thesis Specifications, Section 12.5, Doctoral, for submission deadlines. The doctoral thesis will be examined by a board consisting of at least five members, including the thesis supervisor, an examiner from a department other than that of the candidate, the members of the candidate's advisory committee, and an external examiner who is a recognized authority on the subject of the thesis. The Dean of the Faculty of Graduate and Postdoctoral Affairs, the Dean of the candidate's Faculty, and the chair/director of the candidate's department, institute or school are ex officio members of the board. The Dean of the Faculty of Graduate and Postdoctoral Affairs appoints an independent chair of the board, who is not from the candidate's department, institute or school.

The Dean of the Faculty of Graduate and Postdoctoral Affairs will announce the constitution of the examination board; both it and the thesis examination process are defined by the Thesis Examination Policy found at [carleton.ca/fgpa/ccms/wp-content/ccms-files/Thesis-Examination-Policy.pdf](http://carleton.ca/fgpa/ccms/wp-content/ccms-files/Thesis-Examination-Policy.pdf)

#### Thesis Weight

Thesis weight must be identified at the time of admission. A change in the thesis weight at a later date requires the approval of the Dean of the Faculty of Graduate and Postdoctoral Affairs. The work of each Ph.D. candidate will be assisted by an advisory committee of faculty members who will aid the candidate in their preparation for the final comprehensive examination, and assist in the evaluation of the thesis and its oral examination.

### 12.4 Integrated Thesis Policy

Many disciplines, especially in engineering and the sciences, accept a thesis consisting of student work based on published papers, conference proceedings, or papers awaiting publication. Known as the 'integrated article,' 'manuscript,' 'sandwich,' or 'chapter' thesis, this type of thesis contrasts with the monograph thesis traditionally offered for examination. However, the same quality and ethical standards apply to each thesis type and the authority of the Thesis Examination Committee remains the same for both. Each individual academic unit decides the thesis format(s) suitable for its discipline.

#### Criteria for Integrated Article Thesis:

The integrated article thesis is acceptable under the following conditions:

- The integrated thesis must consist of a coherent account of a unified research project. It is not a



collection of loosely connected papers. The student will provide a document that locates a body of work within the context of existing theoretical and methodological debates in the literature, identifies the contributions of the thesis research to that literature and indicates potential directions for further research based upon knowledge gained through the thesis research.

- The thesis must be original and present the student's own work completed during the program of study for which the thesis is being submitted. The student should be the sole author or principle author of any included materials. The student must have played a major or sole role in the design of the research and in the preparation and writing of the material.

The thesis must contain a statement signed by the thesis supervisor verifying the student's contribution to the originality of the material presented in the thesis and clarify in what way the included materials became part of the thesis. [N.B. This authorization can be provided as part of the Thesis Defence Authorization Form (Appendix D-1)]

- The same text from a multiple authored published article, conference proceeding, or article awaiting publication cannot be used in more than one thesis and must have clear single author attribution. Multiple authored materials cannot therefore normally be used in more than one thesis. Normally, only one student may submit the material. In the case of students who have worked collaboratively on projects leading to a published article, conference proceeding, or article awaiting publications, different sections of text with different single author attribution may be included in different theses. However, it may be preferable in such cases for both students to write a monograph thesis.
- A prior graduate thesis or sections of a prior graduate thesis cannot be included as an article in the Ph.D. thesis. The goal is to present a coherent body of research rather than a collation of every piece of work that the student has produced.
- Students will be requested to sign a statement attesting to the fact that no text in the thesis has appeared in another thesis.
- Issues of copyright must be addressed by the student as outlined in the copyright section below.

#### **Integrated Article Thesis Examinations:**

- Article publication or acceptance of publication does not supercede the authority or responsibility of the Thesis Examination Committee to evaluate the thesis during the examination process and to recommend or require changes.
- Thesis examination rules/policies and procedures are not changed to accommodate the integrated article thesis.
- The oral examination concentrates on testing the candidate's knowledge as much as on questioning the written document.
- Examination committee memberships are no different for the integrated article thesis than for the traditional thesis model. However, the Faculty of Graduate and Postdoctoral Affairs must be notified of this thesis format prior to the defence so potential external examiners can be advised before they accept the position.

#### **Integrated Article Format:**

The text of the thesis must conform to the traditional thesis formatting rules (e.g. paper margins, font type, line spacing, consecutive pagination). Submitted and published articles must be reformatted so the style of the whole thesis is consistent with university thesis guidelines.

The body of an integrated article thesis should contain the following chapters:

##### **Abstract**

The abstract includes a brief description of the subject matter and summarizes the main themes presented in the thesis.

##### **Preface**

The preface must contain a statement that clearly distinguishes the contributions of the student from those of all other collaborators or co-authors, details of each publication and the extent of the collaboration that exists with any co-authors. Use of copyrighted material must be acknowledged in the preface and tables and figures must have "Reprinted with permission of..." in their captions. The objective of this requirement is to assure examiners that there has been full disclosure of collaborative activity. Students must also indicate how others are to cite material from this thesis.

##### **Introductory Chapter /Literature Review**

The introductory chapter provides a comprehensive review of the literature that establishes the student's familiarity with relevant work in the field; sets out the objectives of the thesis; places the research into the larger context of the candidate's discipline; and provides an overall thematic cohesiveness of the chapters (research papers) to the reader.

##### **Methods Chapter**

The methods chapter should include an overview of the methodological approach used in the thesis and the common methodological assumptions or techniques that link the data chapters into a cohesive entity.

##### **Data (Research Paper) Chapters**

Normally, 3 articles (more likely 4) form the body of the thesis and are divided into separate chapters. This work must be smoothly integrated into the flow of the thesis to produce a unified and appropriately sequenced argument. To do so may require some additions, deletions or re-writing of the original material.

##### **Conclusion**

The conclusion chapter summarizes and critiques the research topic as a whole, offers an analysis of the limitations existing in the study and suggests potential areas of future research based on the thesis findings.

##### **Bibliography and References and Citations**

Bibliographic format should be appropriate to the discipline. Methods of handling and listing references in the text vary. Because the body of the thesis contains chapters representing a separate piece of published work, each chapter may contain its own bibliography. Depending upon the situation, the literature review and/or summary chapter may also contain bibliographies to reflect individual citations made in those sections.

Tables and figures should be included in appropriate chapters and numbered consecutively using the chapter number e.g. Chapter 2 would be numbered Table 2-1, 2-2 and so on. This practice avoids the table number repetition that may occur if separate published article material is used.

**Appendices**

Appendices are optional. Normally, appendices are included to provide information that detracts from the readability of the main body of the text or to present data or information used in the thesis but not directly obtained by the thesis author. For example, lengthy tables, detailed explanation of laboratory procedures, and computer programs may be included in the appendices.

**Copyrighted Materials and Permissions:**

- Use of copyrighted material must be acknowledged in the Preface and tables and figures must have "reprinted with permission of..." in their captions.
- If the student wishes the work to include text that has already been published as a journal article or book chapter, the student must obtain permission from the publisher and include it along with the thesis as a separate document. Note that Library and Archives Canada request that permissions be submitted separately with the thesis.
- In a case where a thesis includes papers co-authored by the student and others, the thesis must state explicitly who contributed to such work and the nature and extent of that contribution. The candidate must obtain permission from the co-authors to use this work and include a statement of permission in the appendices.

**12.5 Deadlines****Master's Thesis**

Master's students expecting to graduate at the Spring Convocation must submit their thesis to their supervisor, in examinable form, by March 1. Master's students expecting to graduate at the Fall Convocation must submit their thesis by August 1. Master's students expecting to graduate at the Winter Graduation must submit their thesis by December 1.

**Doctoral Thesis**

Ph.D. students expecting to graduate at the Spring Convocation must submit their thesis to their supervisor, in examinable form, by March 1. Ph.D. students expecting to graduate at the Fall Convocation must submit their thesis by August 1. Ph.D. students expecting to graduate at the Winter Graduation must submit their thesis by December 1.

**12.6 Specifications**

- The candidate must submit six printed copies for examination which must comply with the special departmental requirements governing the form of the thesis, including methods of bibliographical entry and the use of diagrams and tables.
- Each thesis must be accompanied by a suitable abstract. The abstract of a master's thesis should not exceed 150 words, while the abstract of a doctoral thesis may be up to 350 words in length.
- Regulations regarding style, pagination, certification, acceptance, grade and size of paper, abstracts, reproduction, microfilming, binding, and the constitution of the examining board will be prescribed by the Faculty of Graduate and Postdoctoral Affairs.

**Master's Thesis**

Students are expected to notify their supervisor and the chair of the department at least two weeks in advance of the date on which they intend to submit the completed thesis. Six copies of the completed thesis must be submitted to the department at least four weeks in advance of the intended date of examination. The thesis examination and defence will then be scheduled and the date will be announced at least two weeks in advance. The department, institute

or school must deposit one copy of the thesis with the office of the Faculty of Graduate and Postdoctoral Affairs at least two weeks in advance of the actual date for the examination and defence.

**Doctoral Thesis**

The candidate is expected to notify their supervisor and the chair of the department at least two weeks in advance of the date on which they intend to submit the completed thesis. The candidate is then expected to submit six copies of the completed thesis to the department at least six weeks in advance of the intended date of examination. The thesis examination and defence will then be scheduled and the date will be announced by the Dean of the Faculty of Graduate and Postdoctoral Affairs at least four weeks in advance. The department, institute or school must deposit one copy of the thesis to the office of the Faculty of Graduate and Postdoctoral Affairs at least four weeks in advance of the actual date for the examination and defence.

The Faculty of Graduate and Postdoctoral Affairs requires the submission of two unbound paper copies of the approved master's/doctoral thesis. Please note that Faculties/ Departments/ Institutes/Schools may have an additional requirement for bound paper copies to meet degree requirements. Students should contact their department, institute or school to determine the number of required bound copies. Refer to Graphic Services for binding information at <http://www2.carleton.ca/graphicservices>.

**12.7 Licence to the University and to the National Library of Canada**

In the interest of facilitating research by members of the Carleton community and by interested outsiders, and in consideration of their having been accepted as a graduate student at Carleton, the author of a thesis or dissertation submitted in partial fulfillment of the requirements for an advanced degree shall grant to the University and to the National Library of Canada a license to make single copies or microfilms, solely for the purpose of private study and research, in response to written requests from individuals, libraries, universities, or similar institutions.

Students wishing to participate in electronic distribution of their research are advised to review the revised procedures available online <http://www.collectionscanada.gc.ca/thesescanada/index-e.html>

It is understood that the author retains other publication rights, and that neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

**12.8 Withholding of Thesis Deposition**

If, at the time of submitting their thesis, students elect to protect any rights to immediate commercial publication, or to obtain a patent which may arise from their research, or to keep their thesis out of circulation, they may apply in writing to the Dean of the Faculty of Graduate and Postdoctoral Affairs requesting that the thesis be withheld from deposit in the library:

- for an additional period of three months, without reason;
- for each additional period of six months, with reason (total period of restriction not to exceed two years).

A request for extension of the restriction must be submitted one month prior to the termination of the approved s period. Justification for extension of the restriction is required.



### 12.9 Degree Completion

A registered candidate who completes their degree requirements by depositing the thesis prior to the last day for withdrawal in any term (as specified in the academic schedule) is required to request formal withdrawal for refund purposes if they anticipate any refund of fees.

This applies to thesis or research essay registration.

## 13. Time Limits for Program Completion

### 13.1 General Remarks

There are maximum time limits for the completion of programs. Students may also be subject to time constraints prescribed by individual programs to ensure orderly and timely progress through their programs.

### 13.2 Master's Program

#### Full-time

All master's students admitted as full-time students must complete their degree requirements within two calendar years after the date of initial registration, regardless of any subsequent change of status to part-time. Terms of non-registration are equated to full-time registration terms when calculating the overall time to program completion.

#### Part-time

All master's students admitted as part-time students must complete their degree requirements within six calendar years after the date of initial registration. Terms of non-registration are equated to part-time registration terms when calculating the overall time to program completion. A change of a student's status from part-time to full-time status will result in a pro-rated reduction in the required time to completion for each subsequent term of full-time study.

Failure to complete the program within the prescribed time lines or failure to maintain continuous registration will require reevaluation of the student's entire program and may result in termination.

### 13.3 Doctoral Program

#### Full-time

All Ph.D. students admitted as full-time students and admitted on the basis of a master's degree (that is, with a program of 10.0 credits or the equivalent) must complete the Ph.D. degree requirements within five calendar years after the date of initial Ph.D. registration, regardless of any subsequent change of status to part-time. Terms of non-registration are equated to full-time registration terms when calculating the overall time to program completion.

#### Part-time

All Ph.D. students admitted as part-time students must complete the degree requirements within nine calendar years after the date of initial Ph.D. registration. Terms of non-registration are equated to part-time registration terms when calculating the overall time to program completion. A change of a student's status from part-time to full-time status will result in a pro-rated reduction in the required time to completion for each subsequent term of full-time study.

Failure to complete the program within the prescribed time lines or failure to maintain continuous registration will require reevaluation of the student's entire program and may result in termination.

### 13.4 Exemption from Time Limit

When exemption from registration for a term or terms has been approved by the Dean of the Faculty of Graduate and Postdoctoral Affairs, this period will be exempt from the overall time limit allowed for completion of the program. An administration charge for each term of exemption will be applied to the student's account.

For Exemption from Time Limit procedure/forms please visit <http://www2.carleton.ca/fgpa/student-forms/>

### 13.5 Extension of Time Limit

Time limits are strictly enforced. An extension of a student's time to completion will be considered only when there is substantial evidence that the student has attempted to make regular and consistent progress toward completion of the degree requirements. A written request to extend the completion date must be submitted to the Dean of the Faculty of Graduate and Postdoctoral Affairs one term before the normal time period to complete the degree expires. The request must be supported by the student's thesis supervisor and the program graduate supervisor/associate chair (graduate affairs). The request must include a plan of remaining work including the anticipated time of completion of the degree requirements. Each subsequent request to extend a student's completion date requires greater justification. Third requests for extensions are rarely, if ever, granted. Being employed full time is not in itself considered sufficient grounds for granting an extension.

An administrative charge for each term of extension will be applied to the student's account.

For Time Extension procedure/forms visit [carleton.ca/fgpa/student-forms](http://carleton.ca/fgpa/student-forms)

### 13.6 Co-operative Education Policy

Some departments within the University make provision for co-operative placements at the Master's level. Normally, two terms of co-op placement or work terms are required to graduate with the co-op designation.

The "Co-op Option" offers a unique opportunity for qualified full time graduate students to combine their academic studies with practical work experience. Students must be registered full time in their program and registered with the University's Department of Career Development and Co-operative Education.

Students admitted to the co-operative degree programs will be registered part-time during their work terms, and will be registered full time during the study terms. While on a work term, students are limited to registering in an additional .5 credit or their thesis. Students can request exemption from continuous registration in their thesis/research essay/independent research project during a work term. The additional .5 credit cannot interfere with the work placement.

Students in the co-operative education option are not eligible to draw upon scholarship/award funds i.e. Teaching Assistant and/or Research Assistant during a work term.

For more information, please visit [carleton.ca/fgpa/student-forms/policies-and-guidelines/](http://carleton.ca/fgpa/student-forms/policies-and-guidelines/)

### 13.7 Grade Review

Within one month of the release of grades or the announcement of examination by committee (comprehensive examination, research essay or thesis) results, a graduate student may request, through the Faculty of Graduate and Postdoctoral Affairs, that one or more of their grades or results be

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reviewed. The results of examination by committee (including comprehensive, research essay or thesis examinations) will only be reviewed on procedural grounds. Grades for other courses will be reviewed through the submission of all or part of the written coursework to two re-readers. The identity of the student will remain confidential. The average grade of the re-readers will replace the original of the reviewed work. Parts of grades based on non-written work (e.g., participation) will not be reviewed. The administration fee must accompany the review request. The process for the conduct of reviews can be found at [www.carleton.ca/fgpa/student-forms/policies-and-guidelines/](http://www.carleton.ca/fgpa/student-forms/policies-and-guidelines/)

Note: The review process will not take place if the fee is not remitted. If the grade is raised, the administration fee is refundable.

### 13.8 Program Review

A graduate student has the right to request a review of decisions made concerning their status or any other ruling relating to their program. All such requests are to be made in writing to the Dean of the Faculty of Graduate and Postdoctoral Affairs.

### 13.8 Records Retention Policy

Since 2005 the University has implemented a records retention policy which provides for the destruction of student file folders and their contents after a period of five years has elapsed since the last registration. This policy applies to those students who are formally admitted and registered in degree programs. Further information on this policy can be obtained by contacting the Faculty of Graduate and Postdoctoral Affairs.

## 14.0 Academic Integrity

### 14.1 Introduction

Carleton University is a community of scholars dedicated to teaching, learning and research. Sound scholarship rests on a commitment to a code of academic integrity that stresses principles of honesty, trust, respect, fairness and responsibility. The University demands integrity of scholarship from all of its members including students. The quality and integrity of academic work is paramount in achieving student success.

The University states unequivocally that it demands academic integrity from all its members. Academic dishonesty, in whatever form is ultimately destructive to the values of the University. Furthermore, it is unfair and discouraging to those students who pursue their studies honestly. The integrity of university academic life and the degrees conferred by the university is dependent upon the honesty and soundness of scholarship. Conduct by any person that adversely affects this process is a serious matter. Students who violate the principles of academic integrity through dishonest practices undermine the value of the Carleton degree. Dishonesty in scholarly activity cannot be tolerated. Any student who violates the standards of academic integrity will be subject to appropriate sanctions.

### 14.2 The Policy

The University has adopted a policy to deal with allegations of academic misconduct. This policy is expressed in the document Carleton University Academic Integrity Policy, effective July 1, 2006. The policy describes in detail its scope of application, principles, definitions, rights and responsibilities, academic integrity standards, procedures, sanctions, transcript notations, appeal process, and records implications.

The complete policy is available at: [carleton.ca/studentsupport](http://carleton.ca/studentsupport)

### 14.3 Academic Integrity Standards

From the Academic Integrity Policy (Section VI):

Effective adherence to academic integrity requires that students understand the meaning of academic dishonesty. The following list describes conduct that violates standards of academic integrity which may lead to the imposition of sanctions pursuant to this policy. It is important to note that this is not a comprehensive list and should not be viewed as exhaustive.

#### 1. Plagiarism

Plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own. Plagiarism includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source. Examples of sources from which the ideas, expressions of ideas or works of others may be drawn from include but are not limited to: books, articles, papers, literary compositions and phrases, performance compositions, chemical compounds, art works, laboratory reports, research results, calculations and the results of calculations, diagrams, constructions, computer reports, computer code/software, and material on the Internet.

Examples of plagiarism include, but are not limited to:

- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one's own;
- failing to acknowledge sources through the use of proper citations when using another's works and/or failing to use quotation marks.

#### 2. Unauthorized Resubmission of Work

A student shall not submit substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs. Minor modifications and amendments, such as phraseology in an essay or paper do not constitute significant and acceptable reworking of an assignment.

#### 3. Unauthorized Cooperation or Collaboration

An important and valuable component of the learning process is the progress a student can make as result of interacting with other students. In struggling together to master similar concepts and problems and in being exposed to each other's views and approaches, group of students can enhance and speed the learning process. Carleton University encourages students to benefit from these activities. However, it is also critically important that each individual student's abilities and achievements form the basis of the evaluation of that student's progress. As result, while collaboration is supported as being beneficial for various components of course and is generally

encouraged, instructors typically limit the amount of collaboration allowed and communicate this to students in the course outlines. To ensure fairness and equity in assessment of term work, students shall not cooperate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis. Failure to follow the instructor's directions regarding which assignments, or parts of assignments, should be completed by the individual alone will be considered violation of the standards of academic integrity.

#### 4. Misrepresentation

Students shall not submit or present false assignments, research, credentials, or other documents or misrepresent material facts for any academic purpose. Examples of misrepresentation include but are not limited to:

- research or lab results and data;
- concocted facts or references;
- medical or compassionate certificates;
- admission documents;
- letters of support or other letters of reference;
- academic records, transcripts, diplomas or other registrarial records;
- misrepresenting the date or time of submission;
- changing a score or record of an examination result and/or
- altering graded work for resubmission.

#### 5. Impersonation

It is a violation of the standards of academic integrity to impersonate another person or enter into an arrangement with another to be impersonated by any means for the purposes of gaining academic advantage including in the taking of examinations, tests, or the carrying out of laboratory or other assignments.

#### 6. Withholding

It is a violation of the standards of academic integrity to withhold records, transcripts or other academic documents to mislead or gain unfair academic advantage.

#### 7. Obstruction and Interference

It is a violation of the standards of academic integrity to obstruct or otherwise interfere with the scholarly activities of another in order to gain unfair academic advantage. This includes but is not limited to interfering or tampering with data or files, with human or animal research subjects, with a written or other creation (e.g. painting, sculpture, file), with a chemical used for research, with any other object or study or research device or with library, electronic or other materials intended for academic use.

#### 8. Disruption of Classroom Activities or Periods of Instruction

Carleton University has a commitment to provide a safe environment for learning. It is a violation of the standards of academic integrity for student registered in class to disrupt the class or other period of instruction with any action or behaviour reasonably judged by the instructor, lab assistant or tutorial assistant to be detrimental to the class. Normally disruption of activities outside of the classroom or outside of periods of instruction or by a student not registered in the class is dealt with under the Student Rights and Responsibilities Policy, but in particular cases may be subject also to this Policy.

#### 9. Improper Access

It is a violation of the standards of academic integrity to improperly obtain access to confidential information such as examinations or test questions or to gain undue academic advantage as result of such behaviour.

#### 10. Improper Dissemination

It is a violation of the standards of academic integrity to publish, disseminate or otherwise make public to third party without prior written consent, confidential information. Confidential information includes but is not limited to academic information, data or documents which are not otherwise publicly available and which have been gathered or held with reasonable expectation of confidentiality. In particular, students are expected to follow the Carleton University Policies and Procedures for the Ethical Conduct of Research.

#### 11. Assisting in the Violation of the Standards of Academic Integrity

To assist anyone in violating the standards of academic integrity is itself violation of academic integrity standards and subject to this policy. For example, giving another student an assignment that you have submitted for another class and allowing that student to copy parts of the assignment and submit it as his/her own work would be a violation of this policy.

#### 12. Tests and Examinations

The University is committed to ensuring fairness and consistency in the completion of examinations. As part of this commitment, students are required to follow proper examinations procedures. A student who commits a violation of this policy on an examination, test, or takehome examination, or obtains or produces an answer or unfair advantage by deceit, fraud, or trickery, or by an act contrary to the rules of the examination are subject to the sanction under this Policy.

These rules include but are not limited to:

- bringing to the examination/test room any textbook, notebook, memorandum, other written material or mechanical or electronic device not authorized by the examiner
- writing an examination or part of it, or consulting any person or materials outside the confines of the examination room without permission to do so
- leaving answer papers exposed to view
- attempts to read other students' examination papers and/or speaking to another student (even if the subject matter is irrelevant to the test).

A violation of this policy may also occur by breaching one of the formal examination rules included on the back of the examination booklet. (These rules are outlined in Appendix A of the Policy, and in Section 14.2 of these Regulations.)

#### 14.4 Procedures

Instructors, advisors and/or supervisors must report all suspected cases of violation of the Academic Integrity Policy to the Faculty Dean. Details of the procedures to be followed in the event of a suspected violation can be found in Section VII, Procedures, of the Carleton University Academic Integrity Policy at [carleton.ca/studentsupport](http://carleton.ca/studentsupport)

#### 14.5 Sanctions

In cases where an investigation determines that a violation of the Academic Integrity Policy has occurred, sanctions may be applied by the Faculty Dean, the Provost and Vice President (Academic), or by Senate Executive.



## General Regulations

Sanctions may include but are not limited to completion of a remediation process, a written reprimand, assignment of a failing grade, withdrawal from a course, suspension from a program, suspension or expulsion from the University. Sanctions may be used independently or in combination for any single violation. This list is not exhaustive and intended only as a guide. For a complete description of possible sanctions, consult Section IX, Sanctions, of the Carleton University Academic Integrity Policy, available at: [carleton.ca/studentaffairs](http://carleton.ca/studentaffairs)

## 15. Offences of Conduct

### Offences of Conduct — Discrimination and Harassment

The University has in place policies and procedures to deal with allegations of discrimination and harassment, including sexual harassment. These are outlined in detail in the Carleton University Human Rights Policies and Procedures, effective May 1, 2001 and which can be found on the Carleton Web site under Equity Services.

Unacceptable conduct is outlined in the policy and includes discrimination or harassment based on race, ancestry, place of origin, colour, ethnic origin, citizenship, creed, political affiliation or belief, sex, sexual orientation, gender identity, age, marital status, family status, or disability/handicap within the meaning of the Ontario Human Rights Code. Unacceptable conduct also includes threatening, stalking and unwelcome communication either in person or through electronic or other means. For the three policy sections below, the definition of prohibited behaviour is described in the italicized section which follows.

**From the Anti-Racism and Ethnocultural Relations Policy**  
'6. The University prohibits discrimination and harassment, including conduct on the basis of race, ancestry, place of origin, colour, ethnic origin and citizenship that:'

#### From the Gender Equality Policy

'6. The University prohibits discrimination and harassment, including conduct on the basis of sex, gender or gender identity that:'

#### From the Sexual Orientation Equality Policy

'5. The University prohibits discrimination and harassment, including conduct on the basis of sexual orientation or perceived sexual orientation that:'

5.1 Is abusive, demeaning or threatening including behaviour such as name calling; derogatory remarks, gestures and physical attacks; or display of derogatory or belittling pictures and graffiti; or

5.2 Biases administrative and appointment decisions, employment and workplace practices, tenure, promotion, appointment, leave and salary determinations; or

5.3 Biases academic decisions such as admissions, grading, the application of regulations and requirements and scheduling of academic activities; or

5.4 Misuses power, authority or influence; or

5.5 Discriminates in the provision of goods and services, or access to premises, accommodation and other facilities.'

#### From the Sexual Harassment Prevention Policy

'6. Sexual harassment occurs when an individual engages in sexually harassing behaviour or inappropriate conduct of a sexual nature that is known, or ought reasonably be known, to be unwelcome, and that:

6.1 Interferes with the academic or employment performance or participation in a University-related activity for the person harassed; and/or

6.2 Is associated with an expressed or implied promise of employment-related or academic-related consequence for the person harassed (including reward, reprisal or condition of study or employment); and/or

6.3 Provides a basis for academic or employment decisions affecting the person harassed; and/or

6.4 Creates an abusive, demeaning, or threatening study, work or living environment for the person harassed; and/or

6.5 Excludes the person harassed from rights and/or privileges to which they are entitled.

7. Sexually harassing behaviour may be physical, verbal or psychological. It may be conveyed directly or by telephone, writing or electronic means. Examples of inappropriate sexual conduct include:

7.1 Unwelcome sexual solicitations, flirtations or advances; sexually suggestive comments, gestures, threats or verbal abuse;

7.2 Unwarranted touching or physical contact of a sexual nature, coerced consent to sexual contact, or sexual assault;

7.3 Inappropriate display or transmission of sexually suggestive or explicit pictures, posters, objects or graffiti;

7.4 Leering, compromising invitations, or demands for sexual favours;

7.5 Degrading, demeaning or insulting sexual comment or content, including unwelcome remarks, taunting, jokes or innuendo about a person's body, sexuality, sexual orientation or sexual conduct;

7.6 Misuse of position or authority to secure sexual favours;

7.7 Persistent, unwanted attention or requests for sexual contact after a consensual relationship has ended; or

7.8 A course of sexualized comment or conduct that interferes with the dignity or privacy of an individual or group.'

Enforcement of this policy is carried out according to the procedures established in the policy. The procedures include the provision of advice and information to complainants and respondents and allow for various methods of informal resolution, including mediation.

Students with concerns regarding discrimination, harassment, stalking, sexist or racist behaviour, or any other prohibited action as outlined in the Human Rights Policy, should call or meet with a member of Equity Services for advice and guidance on how to handle the situation. This service is confidential and does not compel the student to take any further action.

Formal complaints must be made in writing and directed to the Dean or Vice President responsible for the area where the complaint took place. Staff in Equity Services are available to assist with the preparation of a formal complaint. Complaints must be made within 12 months after the last alleged incident of discrimination or harassment unless exceptional circumstances apply in which case the University Secretary may grant an extension of up to an additional 12 months.

The procedure for formal complaints is outlined below:

1. An allegation shall be made in writing to the Dean of the Faculty in which the program to which the respondent has been admitted belongs or, in the circumstances where the respondent has not been admitted to a program, to the Dean of the Faculty where the majority of courses in which the respondent has registered are administered. An allegation against a student in residence when made by another student in residence which involves the complainant's enjoyment of her/his accommodation shall be made to the Vice-President (Academic). The Dean, or the Vice-President (Academic), as the case may be, shall cause to have an investigation conducted and, upon receipt of the report of the investigation, shall either 1) dismiss the allegation on the grounds of insufficient evidence or lack of jurisdiction by the University, or 2) accept that the allegation is founded and seek the agreement of the respondent to a remedy, or 3) refer the matter to the President. A Dean's dismissal of the allegation may be appealed, within ten working days, to the Vice-President (Academic) who may, in turn, either 1) again dismiss the allegation, or 2) accept that the allegation is founded and propose a remedy to the respondent, or 3) refer the matter to the President. In the case of students in residence, where the original allegation has been made to the Vice-President (Academic) and is dismissed, appeal shall be directly to the President who may either 1) again dismiss the allegation, or 2) accept that the allegation is founded and propose a remedy to the respondent, or 3) refer the matter to a tribunal appointed by the Senate.

2. In the instance where the matter has been referred to the President, the latter shall decide whether or not the University shall conduct a hearing before a tribunal appointed by the Senate.

If the allegation is proven, the tribunal shall decide upon one of the following sanctions:

The student may be:

- a) expelled;
- b) suspended for a period of time from all studies at the University;
- c) restricted in his/her use of University facilities; and/or
- d) given a reprimand.

Should the President decide not to conduct a hearing before a tribunal, the allegation shall be deemed to have been dismissed, but the President shall give written reasons for such a decision, and these reasons shall be communicated to the parties involved.

3. In the instance where the complainant wants redress from the University without the involvement of the respondent, or where the respondent is unknown or is not a member of the University community, and/or where there is a claim that the University has failed or has been negligent in providing a safe, non-hostile environment, the allegation of an offence shall be made in writing to the President, who shall cause an investigation to be conducted. Upon receipt of the report of the investigation, the President may order any relief he/she deems fit, and shall give written reasons for the decision; which reasons shall be communicated to the complainant.

Information about procedure governing tribunals is available from the Clerk of Senate.

## 16. Appeals and Petitions

### 16.1 Criteria and Procedures

Assuming that a graduate student has exhausted all avenues of appeal and petition with the Dean of the Faculty of Graduate and Postdoctoral Affairs (questions regarding the appeals process can be directed to the Office of the Dean at 613-520-2518), a graduate student may appeal the decision of the University to deny the award of degree or the required withdrawal of the student to the Senate upon certain specific grounds.

Such grounds are the allegation by the student that the student has been denied a degree or forced to withdraw because of some mistake, error, or improper conduct by the University, its officers, or employees.

A graduate student may petition the Senate to grant a degree or to stay a decision of required withdrawal on compassionate grounds.

Such appeals and petitions must be submitted in writing, within ninety days of receipt by the student of the decision which is to be appealed or petitioned, to the Clerk of Senate.

## 17. Graduation

### 17.1 Conferring of Degrees

On the recommendation of the Faculty of Graduate and Postdoctoral Affairs and with the approval of the Senate of the University, degrees are conferred by the Chancellor in the spring and fall of each year.

### 17.2 Application Deadlines

Candidates may have their degrees certified in February each year; they must apply by December 1. Students expecting to graduate at the Spring Convocation must apply for graduation in the Graduate and Postdoctoral Affairs office by March 1. Those expecting to graduate at the Fall Convocation must apply by September 1.



# Programs

## Anthropology

Department of Sociology and Anthropology  
B742 Loeb  
613-520-2582  
carleton.ca/socanth

- M.A. Anthropology
- Ph.D. Anthropology
- Ph.D. Anthropology with Specialization in Political Economy (consult the Political Economy section of this Calendar)

### M.A. Anthropology

#### About the Program

The Anthropology programs promote exploration of cultural practices and social conditions in diverse contexts throughout the world. The M.A. program focuses on the field of sociocultural anthropology.

#### Academic Regulations

See the General Regulations section of this Calendar.

A grade of B- or better is required in each credit counted toward the master's degree. With the recommendation of the department, and permission of the Dean of the Faculty of Graduate and Postdoctoral Affairs, a candidate may be allowed a grade of C+ in 1.0 credit or each of two 0.5-credits.

#### Admission Requirements

The requirement for admission into the master's program is a B.A. Honours (or the equivalent) with at least high honours standing in anthropology or a closely-related field. Where relevant, previous professional experience will be taken into account in determining an applicant's standing on admission.

#### Qualifying-Year Program

Applicants with general (three-year) bachelor's degrees may be admitted into a qualifying-year program designed to raise their standing to honours status. Students earning at least high honours standing in their qualifying-year courses will be considered for admission into the master's program. Refer to the General Regulations section of this Calendar for details of the regulations governing the qualifying year.

#### Program Requirements

The Master of Arts program in Anthropology is a total of 5.0 credits, and each candidate is required to select, in consultation with the graduate adviser, one of the three program options.

#### Thesis Program

- 0.5 credit in ANTH 5401: Theories and Methods I (normally to be taken in the first fall term after admission to the program)
- 0.5 credit in ANTH 5402 Theories and Methods II
- 2.0 credits in electives
- 2.0 credits in ANTH 5909: Master's Thesis and an oral examination on the thesis

#### Research Essay Program

- 0.5 credit in ANTH 5401: Theories and Methods I (normally to be taken in the first fall term after admission to the program)
- 0.5 credit in ANTH 5402: Theories and Methods II
- 3.0 credits in electives

- 1.0 credit in ANTH 5908: Research Essay and an oral examination on the essay

#### Course Work Program

- 0.5 credit in ANTH 5401: Theories and Methods I (normally to be taken in the first fall term after admission to the program)
- 0.5 credit in ANTH 5402: Theories and Methods II
- 4.0 credits in electives

Electives may be chosen, in consultation with the student's adviser, from the following courses: anthropology graduate course offerings; sociology graduate courses (especially in theory and methods, or in areas which relate to the student's thesis research interests); from 4000-level courses offered in the sociology and anthropology undergraduate program; or a combination of the above. Normally no more than 1.0 credit may be chosen from course offerings in other departments.

#### Transfer from One M.A. Option to Another M.A. Option

Students who choose to change from one program option to another (i.e., from/to the thesis, research essay, or course work option), are required to do so before registering for a third term after initial, full-time registration, or before registering for a fifth term after initial part-time registration.

### Ph.D. Anthropology

#### About the Program

The Anthropology programs promote exploration of cultural practices and social conditions in diverse contexts throughout the world. The doctoral program is structured around the field of engaged anthropology, which emphasizes practical involvement with the social world through ethnographic and theoretical analyses of cultural frameworks and social fields shaping interactions amongst humans and between humans and the environment.

#### Academic Regulations

See the General Regulations section of this Calendar.

Candidates must obtain a grade of B- or higher in each course and Satisfactory on the Ph.D. thesis and its oral defence.

#### Admission Requirements

The Ph.D. Anthropology normally will be undertaken on a full-time basis, however the department will consider admission on a part-time basis. Full-time students are expected to complete the program in four years, and part-time students are expected to complete the program in eight years.

The normal requirement for admission to the Ph.D. program is a master's degree (or equivalent) in anthropology, normally with a minimum average of A-, and with no grade below B.

A student already enrolled in the Carleton M.A. program in Anthropology who shows outstanding academic performance and research promise may be permitted to transfer to the Ph.D. program upon completion of the M.A. course work and upon the recommendation of the Anthropology graduate committee.

Applicants whose academic preparation has deficiencies in certain areas may be admitted to the Ph.D. program, but will normally be required to complete additional course work.



Applicants whose first language is not English must demonstrate a fluent knowledge of English. Please see sections 3.6 in the General Regulations section of this calendar.

**Program Requirements**

Ten (10.0) credits:

- 1.0 credit in ANTH 6000 Doctoral Seminar
- 0.5 credit in ANTH 6002 Research Design
- Two terms satisfactory participation in ANTH 6100 Thesis Writing Seminar (0.0 credit)
- 1.5 credits chosen from SOCI or ANTH courses at the 5000- or 6000-level or, with the permission of the graduate supervisor, up to 1.0 credit of graduate level courses from another unit at Carleton
- A satisfactory research preparation portfolio
- A satisfactory thesis proposal and (when required) Research Ethics Board clearance to undertake thesis research
- Satisfactory thesis research
- 7.0 credits in ANTH 6909 Thesis (including successful oral defence)
- Residence requirements: Ph.D. candidates must normally be registered full-time in a minimum of six terms to satisfy the residence requirement. If a candidate is registered part-time the minimum residence requirement is eight terms.

## Applied Linguistics and Discourse Studies

School of Linguistics and Language Studies

Paterson Hall 215

Tel.: 613-520-2802

carleton.ca/slals

- M.A. Applied Linguistics and Discourse Studies
- Ph.D. Applied Linguistics and Discourse Studies

### M.A. Applied Linguistics and Discourse Studies

#### About the Program

The School of Linguistics and Language Studies offers a program of study leading to the degree of Master of Arts in Applied Linguistics and Discourse Studies. This program emphasizes the central role of language in all aspects of educational, professional and social endeavours, focusing on how language is used and how effective language abilities are developed in these contexts. Specific areas of research and study include:

- Teaching English as a second and foreign language
- Curriculum and methodology in second and foreign language teaching
- Language learning and acquisition
- Language assessment and testing
- Writing and written genres in professional and academic contexts
- Adult Literacy, including literacy in bilingual and multi-lingual contexts
- Critical discourse analysis/systemic functional linguistics
- Language policy

Students in the program can concentrate their studies in one of the following fields or, alternatively, they can create a unique synthesis of the two fields which suits their own goals, interests and purposes:

- Applied Linguistics (the teaching and acquisition of additional languages)
- Discourse Studies (the nature, acquisition and teaching of written discourse/literacies)

#### Academic Regulations

See the General Regulations section of this Calendar.

A standing of B- or better must be obtained in each credit counted towards the master's degree.

#### Admission Requirements

The normal minimum requirement for admission to the master's program is a B.A.(Honours) degree in a discipline involving the analysis of language or the study of language use or learning; or a 3 year B.A. in a relevant discipline together with a B.Ed. or C.T.E.S.L.

Students must have achieved high honours standing (a minimum of B+ in related courses and B overall) in their academic work.

Relevant professional experience may also enhance a candidate's application.

For other admission regulations not specific to the School of Linguistics and Language Studies, refer to the General Regulations section of the Graduate Calendar, in particular the subsection on Admission Requirements and Eligibility.

#### Program Requirements

Students will establish their programs in consultation with the School's supervisor of graduate studies.

Each candidate will select one of the following program paths:

- ALDS 5001; ALDS 5002 plus 2.0 credits from the School's graduate listing; and a master's thesis (ALDS 5909).
- ALDS 5001; ALDS 5002 plus 3.0 credits from the School's graduate listing; and a research essay (ALDS 5908).
- ALDS 5001; ALDS 5002 plus 4.0 credits from the School's graduate listing.

The choice of thesis, research essay, or credit program path will be made by the student, with the advice of the Supervisor. Relevant factors will include the student's academic goals, professional goals, and background knowledge.

ALDS 5001 is normally to be taken in the first fall term after admission to the program.

Permission may be granted for enrolment in 1.0 credit offered in another department.

Graduate students may take courses at the senior undergraduate (4th year) level up to a maximum of 1.0 credit. Permission of the School's graduate supervisor is required. Students may take a combination of senior undergraduate courses and 'piggybacked' courses (fourth-year courses also offered, with different requirements, at the graduate level) up to a maximum of 1.5 credits.

It is expected that students will progress steadily towards the completion of requirements for the degree. In particular, it is normally expected that:

- a full-time student will complete 3.0 credits of course work within two terms of study, and an acceptable thesis proposal early in the third term of study; or 4.0 credits of course work within three terms, and an acceptable research essay proposal early in the fourth term; and all degree requirements within six terms of study
- a part-time student will complete 3.0 credits of course work within three years of initial registration, and an acceptable thesis proposal early in the fourth year; or 4.0 credits of course work within four years, and an acceptable research essay proposal early in the fifth year; and all degree requirements within six years of initial registration
- a student who registers in a combination of full-time and part-time study will, in consultation with an adviser, develop a schedule for completion of course requirements and a thesis or research essay proposal, consistent with times to completion stated above and with the overall time limits specified in the General Regulations section in this Calendar.

## Ph.D. Applied Linguistics and Discourse Studies

### About the Program

The School of Linguistics and Language Studies offers a program of study leading to the degree of Doctor of Philosophy in Applied Linguistics and Discourse Studies. This program comprises the following two fields:

- Applied Linguistics (the teaching and acquisition of additional languages)
- Discourse Studies (the nature, acquisition and teaching of written discourse and literacies)

This doctoral program builds on the School's M.A. program, focusing how language is used and how effective abilities are developed in one's first or second language in specific educational, professional and social contexts. The program allows students to develop their own specialized topics of study and research within or across the following areas:

- Teaching English as a second and foreign language
- Curriculum and methodology in second and foreign language teaching
- Language learning and acquisition
- Language assessment and testing
- Writing and written genres in professional and academic contexts
- Adult Literacy, including literacy in bilingual and multi-lingual contexts
- Critical discourse analysis/systemic functional linguistics
- Language policy

### Academic Regulations

See the General Regulations section of this Calendar, and in addition the following:

Candidates must maintain a grade point average of 10.0 or better throughout this program.

### Residence requirement

Ph.D. candidates must normally be registered full-time in a minimum of six terms to satisfy the residence requirement. If a candidate is registered part-time, the minimum residence requirement is eight terms.

### Guidelines for completion of Ph.D. degree

Full-time Ph.D. students are normally expected to complete their requirements in four calendar years. All part-time students must complete their requirements within a period of nine years, as set out in the General Regulations in the Graduate Calendar.

### Admission Requirements

The normal requirement for admission to the Ph.D. program is a Master's Degree in Applied Language Studies, Applied Linguistics, Teaching English as a Second Language, Composition and Rhetoric, or an acceptable equivalent field, with at least an A- average (10 G.P.A.).

Applicants whose academic preparation has deficiencies in certain areas may be admitted to the Ph.D. program with the requirement that they take additional courses. Applicants who have completed an M.A. in the School of Linguistics and Language Studies or elsewhere with an outstanding grade point average (11.0 or above), who are deemed to have an excellent background in and knowledge of research in Applied Linguistics and Discourse Studies at the Master's level, and who have a clear direction for their doctoral research, may be permitted to receive up to 2.0 credits of advanced standing of the first year's doctoral coursework requirement, with the possibility of moving directly into the second year of the program.

In addition to transcripts and letters of reference, applications will include a statement of interest outlining the applicant's proposed area of doctoral research and a representative sample of the applicant's academic writing.

### Program Requirements

Program requirements for the Ph.D. are outlined in the General Regulations section of the Calendar. The specific program requirements for the doctoral program in Applied Linguistics and Discourse Studies are 10.0 credits, to include:

- 1.0 credit in ALDS 6101 and ALDS 6102 Seminar in Applied Linguistics and Discourse Studies, Parts I & II
- 1.0 credit in elective courses
- 1.0 credit in ALDS 6201 and ALDS 6202 Praxis in Applied Linguistics and Discourse Studies, Parts I and II
- 0.5 credit in ALDS 6300 Interpretive Analysis in Applied Linguistics and Discourse Studies
- 0.5 credit in ALDS 6109 Doctoral Project I: Thesis Proposal
- 0.5 credit in ALDS 6209 Doctoral Project II: Praxis Paper
- 0.5 credit in ALDS 6309 Doctoral Project III: Research Progress Report
- 5.0 credits in ALDS 6909 Ph.D. Thesis

## Architecture

Azrieli School of Architecture and Urbanism  
 Rm. 202 Architecture Building  
 Tel.: 613-520-2855  
 carleton.ca/architecture

- M. Architectural Studies
- M. Architecture Professional
- Ph.D. Architecture
- Graduate Diploma in Architectural Conservation

### M. Architectural Studies

#### About the Program

The Master of Architectural Studies (M.A.S.) is a 6 credit non-accredited degree for students interested in pursuing in-depth architectural research. Students holding a M.A.S. may be considered for admission to the PhD program in Architecture.

#### Academic Requirements

See the General Regulations section of this Calendar.

Architecture does not permit the C+ option. (see Section 11.2 of the General Regulations).

#### Admission Requirements

Successful completion of a degree in architectural studies with a minimum academic average of B- in their undergraduate studies.

Application must be accompanied by:

- an essay of no more than 1500 words stating the topic of their future thesis, their selected focus of study defined geographically, temporally and architecturally including possible primary sources;
- a portfolio of projects and creative works; and
- a review of their interaction and experience in architectural or related practice (may be text, drawings and models, or built work) if applicable.

Professional experience may be taken into consideration.

Where applicants do not hold a degree in architecture but possess an honours degree in a related discipline, equivalence may be considered on the basis of a demonstrated, exceptional research ability and high academic standing (B+ minimum average).

When professional work is included as part of an applicant's portfolio, a precise description of the applicant's involvement and responsibilities in the completion of the project must be included.

All applicants must provide two confidential letters of reference on the prescribed forms and a statement of academic and professional objectives.

The Faculty of Graduate and Postdoctoral Affairs requires applicants whose native tongue is not English to be tested for proficiency in English, as described in Section 3.6 of the General Regulations of this Calendar.

An admissions committee, which includes the supervisor of graduate studies, will determine the merits of each applicant on the basis of academic record, evidence of visual and architectural design ability, and, where applicable, professional experience. Enrolment is limited. The School's admission policy is governed by the availability of graduate student space.

### Program Requirements

General requirements:

- 3.5 core course credits
- 0.5 elective course credits
- 2.0 credit thesis which must be defended at an oral examination

Specific requirements:

#### Year 1

##### Fall Term

ARCH 5301, ARCN 5301, ARCH 5101

##### Winter Term

ARCH 5302, ARCN 5302, ARCH 5101

#### Year 2

##### Fall Term

ARCH 5003, ARCT 5909

##### Winter Term

ARCT 5909

#### Notes:

ARCT 5909 normally extends over two terms.

### M. Architecture Professional

#### About the Program

The Master of Architecture Professional is a studio based degree program. The program stresses creativity and innovation within theoretical and practical parameters.

Students entering the program with an undergraduate BAS in Design will follow an 8.0 credit curriculum culminating in a two-credit thesis [M.Arch]. Students entering with a Bachelor of Architectural Studies (Urbanism, Conservation and Sustainability, or Philosophy and Criticism) or an Honours Degree in an unrelated field, will follow a 15.5 credit curriculum [M.Architecture 1] culminating in a two-credit Directed Research Thesis.

#### Academic Regulations

See the General Regulations section of this Calendar.

Architecture does not permit the C+ option (see Section 11.2 of the General Regulations).

#### Admission Requirements

##### M. Architecture – 8.0 credits

- Successful completion of the Bachelor of Architectural Studies in Design (see Undergraduate Calendar) with a minimum academic average of B-.
- Application must be accompanied by two examples of the student's academic writing and a portfolio of their most recent studio work demonstrating facility in architectural design and methods of representation.

##### M. Architecture 1 – 15.5 credits

- Successful completion of a Bachelor of Architectural Studies (Urbanism, Conservation & Sustainability, or Philosophy and Criticism) degree with a minimum academic average of B- in their undergraduate studies.
- Where applicants do not hold a degree in architecture but possess either an honours degree in a related discipline, equivalence may be considered on the basis of a demonstrated, exceptional research ability and high academic standing (B+ minimum average).

**Applicable to both 8.0 credit- and 15.5 credit- programs**

- Professional experience may be taken into consideration.
- The Faculty of Graduate and Postdoctoral Affairs requires applicants whose native tongue is not English to be tested for proficiency in English, as described in Section 3.6 of the General Regulations of this Calendar.
- An admissions committee, which includes the Associate Director [Graduate Programs], will determine the merits of each candidate on the basis of academic record, evidence of visual and architectural design, and, where applicable, professional experience. Enrolment is limited. The School's admission policy is governed by the availability of graduate student space. Possession of the minimum academic admission requirement does not, in itself, guarantee admission.
- All applicants must provide two confidential letters of reference on the prescribed forms and a statement of academic and professional objectives.
- When professional work is included as part of an applicant's portfolio, a precise description of the applicant's involvement and responsibilities in the completion of the project must be included.
- Applications must be accompanied by a) an essay of no more than 1500 words stating the topic of their future thesis, their selected focus of study defined geographically, temporally and architecturally including possible primary sources, b) a portfolio of projects and creative works, and c) a review of their interaction and experience in architectural or related practice (may be text, drawings and models, or built work) if applicable.

**Program Requirements****M. Architecture – 8.0 credits****General requirements:**

- 2.0 core course credits
- 1.0 elective course credits
- 3.0 studio credits
- 2.0 credit in thesis which must be defended at an oral examination

**Specific requirements:****Year 1****Fall Term**

- ARCH 5200, ARCC 5100, ARCS 5105
- ARCC 5200 or 0.5 credit elective from courses at the 5000-level or above, approved by the Associate Director (Graduate Programs)

**Winter Term**

- ARCH 5201, ARCS 5106
- 0.5 credit elective from courses at the 5000-level or above, approved by the Associate Director (Graduate Programs)

**Year 2****Fall Term**

- ARCS 5909 or ARCN 5909 (See Note 1, below)
- ARCC 5200 or 0.5 credit elective from courses at the 5000-level or above, approved by the Associate Director (Graduate Programs)

**Winter Term**

- ARCS 5909 or ARCN 5909 (See Note 1, below)
- 0.5 credit elective from courses at the 5000-level or above, approved by the Associate Director (Graduate Programs)

**M. Architecture 1 – 15.5 credits****General requirements**

- 5.0 credits core courses
- 7.5 credits studio courses
- 1.0 credit History/Theory Elective
- 2.0 credit thesis which must be defended at an oral examination

**Specific requirements:****Year 1****Fall Term**

- ARCC 5096, ARCS 5102
- 0.5 credit History/Theory elective

**Winter Term**

- ARCC 5097, ARCS 5103
- 0.5 credit History/Theory elective

**Year 2****Fall Term**

- ARCC 5098, ARCC 4500, ARCS 5104

**Winter Term**

- ARCH 5201, ARCC 5200, ARCS 5105

**Year 3****Fall Term**

- ARCH 5200, ARCC 5099, ARCS 5106

**Winter Term**

- ARCC 5100, ARCN 5909 (see Note 1, below)

**Summer Term**

- ARCH 5003, ARCN 5909 (see Note 1, below)

**Notes:**

1. ARCS 5909 and ARCN 5909 normally extend over two terms. This project will follow guidelines prescribed by the Associate Director (Graduate Programs).
2. The thesis is expected to include both a written text and a design component with appropriate modes of two and three-dimensional representation, including digital. Final thesis documentation must satisfy the requirements established by the Faculty of Graduate and Postdoctoral Affairs.

**Ph.D. Architecture****About the Program**

Carleton University's Ph.D. in Architecture is an innovative, comprehensive doctoral program that fuses research with critical practice in architecture. Exceptionally talented and thoughtful architects are invited to undertake original, speculative, and experimental research within the well-established trinity of pathos, ethos, and logos that has come to distinguish the School of Architecture at Carleton.

At the Carleton University Azrieli School of Architecture and Urbanism, doctoral projects will draw on the interrelated genetic, performative, and reflective aspects of architecture, design and material process.

**Academic Regulations**

See the General Regulations section of this Calendar.

**Admission Requirements**

- The normal requirement for admission to the doctoral program in Architecture is a Master of Architecture or a recognized equivalent in a discipline related to the strengths of the program.
- A minimum GPA of A-.
- Students enrolled in the Master of Architectural Studies at Carleton University who have shown



Programs - Architecture

outstanding academic performance and research promise may be admitted to the Ph.D. program without completing the master's program. Normal Ph.D. program requirements, as stated below, will apply. Each case will be considered on an individual basis for fast-tracking to the Ph.D. program.

- A portfolio including an essay of no more than a) 1,500 words stating the topic of their future dissertation, selected focus of study defined geographically, temporally and architecturally including possible primary sources, b) a portfolio of projects and creative works, c) a review of interaction and experience in architectural practice, and d) a cover letter addressing why they have decided to apply to Carleton University for their Ph.D.
- The Ph.D. program in Architecture must be undertaken on a full-time basis.
- Students must be proficient (e.g. able to undertake research) in one language other than English or French.

**Program Requirements**

**General Requirements**

Students admitted to the PhD program in Architecture, will be required to complete a total of 10.0 credits as follows:

- 1.0 credit in core Workshop courses
- 1.0 credit in core Seminar courses
- 2.0 credits in PhD. Colloquium
- 1.0 credit in comprehensive examination
- 1.0 credit in dissertation proposal examination
- 4.0 credits in oral defence of thesis

**Specific requirements:**

**Year 1**

**Fall Term**

- ARCH 6001, ARCN 6001, ARCH 6101 (See **Note**, below)

**Winter Term**

- ARCH 6002, ARCN 6002, ARCH 6101 (See **Note**, below)

**Year 2**

- ARCH 6102, ARCH 6907, ARCH 6908 (See **Note**, below)

**Year 3**

- ARCH 6909 (4.0 credits)

**Note:**

ARCH 6101, ARCH 6102, ARCH 6907, ARCH 6908 are 1.0-credit courses and extend over two terms.

**Graduate Diploma in Architectural Conservation**

**About the Program**

The Diploma in Architectural Conservation builds on the strengths of the existing professional Master of Architecture program with five additional credits dealing specifically with the theory and practice of architectural conservation. Students are expected to address heritage issues or questions in their M.Arch. studios and required to address heritage issues or questions in their M.Arch. thesis.

**Academic Regulations**

See the General Regulations section of this Calendar, and in addition the following:

Architecture does not permit the C+ option ( see Section 11.2 of the General Regulations).

**Admission Requirements**

Students must be admitted to the Graduate Diploma in Architectural Conservation from the Master of Architecture Professional Program.

A minimum academic average of B+ in their first year of graduate studies.

Applicants must submit documentation of studio work demonstrating their understanding of heritage conservation.

Professional experience may be taken into consideration.

When professional work is included as part of the portfolio, a precise description of the applicant's involvement and responsibilities in the completion of the project must be included.

All applicants must provide two confidential letters of reference on the prescribed forms and a statement of academic and professional objectives.

Part-time studies are not permitted.

Deferrals are not permitted.

**Program Requirements**

Five (5.0) core course credits:

**Fall Term**

CDNS 5401, ARCH 4002, ARCH 5301, ARCU 5402, ARCN 5100

**Winter Term**

CDNS 5402, ARCH 4200, ARCH 5302, ARCH 5402, ARCC 5401

## Art History

School for Studies in Art and Culture: Art History  
St. Patrick's Bldg. Rm. 423  
Tel.: 613-520-2342  
carleton.ca/artandculture/arhistory

- M.A. Art History

### M.A. Art History

#### About the Program

Carleton's M.A. in Art History emphasizes critical and historical concerns as well as practical experience. Students examine recent theoretical shifts in art history and are offered direct experience with collecting, exhibiting, and researching institutions in the Ottawa area. The program's dual approach trains students to attain a critical awareness of contemporary theoretical debates while working directly with art objects. We maintain professional links to institutions in the National Capital region, including the National Gallery and the Canadian Museum of Civilization, through our strong practicum (internship) program and adjunct faculty members who work at these institutions. Reflecting these institutions' collections, Canadian and Aboriginal art are strengths in the program although we offer a program inclusive of western art with some non-western resources. Graduates of the program will be prepared for careers in the museum, research, and heritage sectors, and for further study in Art History and related disciplines.

#### Academic Regulations

See the General Regulations section of this Calendar.

**Academic standing:** a standing of B- or better must be obtained in each credit counted towards the master's degree.

Regulations governing requirements for the master's thesis, including deadlines for submission, are outlined in the General Regulations section of this Calendar.

#### Admission Requirements

The minimum requirement for admission to the master's program is an Honours bachelor's degree (or the equivalent) in art history or a related discipline, with at least high honours standing. Related disciplines may include anthropology, history, and Canadian studies. Applicants without a background in art history may be required to take up to a maximum of 2.0 credits in certain designated courses from the undergraduate art history program in addition to their regular program.

#### Qualifying-Year Program

Applicants who do not qualify for direct admission to the master's program may be admitted to a qualifying-year program. Applicants who lack an Honours degree, but have a 3-year degree with an honours standing (at least B overall) will normally be admitted to a qualifying-year program. Refer to the General Regulations section of this Calendar.

#### Program Requirements

Students in the M.A. in Art History must select one of the following streams:

#### Coursework Stream

- 1.0 credit in ARTH 5010 [1.0]
- 3.0 credits in Art History. Students are normally required to take 1.0 credit from ARTH 5112, ARTH 5113, ARTH 5114, ARTH 5115, ARTH 5117, ARTH 5210, ARTH 5218, ARTH 5403, ARTH 5500, 0.5 credit in another Art History course and 1.0 credit as a practicum. The remaining 0.5 credit may be taken in Art History or, in special cases where the student's program of study justifies it, alternative courses may be selected with the approval of the Graduate Supervisor.

#### Research Essay Stream

- 1.0 credit in ARTH 5010 [1.0]
- 2.0 credits in Art History, of which 0.5 credit must be selected from ARTH 5112, ARTH 5113, ARTH 5114, ARTH 5115, ARTH 5117, ARTH 5210, ARTH 5218, ARTH 5403, ARTH 5500. Students are normally required to take 1.0 credit as a practicum. The remaining 0.5 credit may be taken in Art History or, in special cases where the student's program of study justifies it, alternative courses may be selected with the approval of the Graduate Supervisor. Out of the 2.0 credits taken, at least 0.5 must be in an area outside that of the student's research paper specialization.
- 1.0 credit in ARTH 5908 [1.0] Research Essay

#### Thesis Stream

- 1.0 credit in ARTH 5010 [1.0]
- 1.5 credits in Art History, of which 0.5 credit must be selected from ARTH 5112, ARTH 5113, ARTH 5114, ARTH 5115, ARTH 5117, ARTH 5210, ARTH 5218, ARTH 5403, ARTH 5500. Students are normally required to take 0.5 credit as a practicum. The remaining 0.5 credit may be taken in Art History or, in special cases where the student's program of study justifies it, alternative courses may be selected with the approval of the Graduate Supervisor. Out of the 1.5 credits taken, at least 0.5 credit must be in an area outside that of the student's thesis specialization.
- 1.5 credits in ARTH 5909 M. A. Thesis (with the approval of the graduate committee).

**Language requirement:** students are required to demonstrate a reading knowledge of French (or another language to be approved by the Art History graduate supervisor).

#### Notes:

- A maximum of 1.0 credit may be selected from course offerings at the 4000-level in Art History.
- To enter the thesis stream, students are required to notify the Graduate Supervisor of their intent at the beginning of their first term of study. The thesis (60-80 pages) is written under the supervision of a faculty member with both expertise and an interest in the student's topic. The Graduate Committee will determine whether a student is eligible to enter the thesis stream after one term of study in the case of full-time students and after two terms of study in the case of part-time students. For those students allowed into the thesis stream, the deadline for the submission of the thesis proposal to the Graduate Committee is normally no later than April 15 of the first year of study for students enrolled full-time, and no later than the middle of the fifth term of registration for students enrolled part-time.

## Bioinformatics

Department of Biology  
207 Nesbitt Building  
Tel.: 613-520-2600 ext. 8814  
carleton.ca/biology

School of Computer Science  
Herzberg Bldg 5302  
Tel.: 613-520-4333  
http://scs.carleton.ca

School of Mathematics and Statistics  
HP 4302  
Tel: 613-520-2155  
www.mathstat.carleton.ca

- M.Sc. Biology with Specialization in Bioinformatics
- M.Sc. Mathematics with Specialization in Bioinformatics
- M.C.S. with Specialization in Bioinformatics

### M.Sc. Biology, M.Sc. Mathematics, M.C.S. with Specialization in Bioinformatics

#### About the Program

Bioinformatics is an emerging and increasingly important scientific discipline dedicated to the pursuit of fundamental questions about the structure, function and evolution of biological entities through the design and application of computational approaches. Fundamental research in these areas is expected to increase our understanding of human health and disease which will translate to innovation in industry (i.e. drug discovery). As a field of research, it crosses traditional disciplinary boundaries such as computer science, chemistry, biology, biochemistry, engineering and the medical sciences. While individual researchers usually specialize in a particular area, bioinformaticians today must be able to appreciate significant research in other fields and therefore require an understanding of the basic principles of other disciplines. To meet this challenge Carleton University and the University of Ottawa offer a collaborative program leading to a Master of Science degree with Specialization in Bioinformatics or Master of Computer Science degree with Specialization in Bioinformatics.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

##### Application to the Program

Applications should be directed to the primary participating unit which is the most appropriate to the student's research interests. Once accepted into one of the participating graduate programs, students must then be sponsored into the collaborative program in Bioinformatics by a faculty member. This is normally the student's supervisor. This faculty member must be appointed, cross-appointed or stand as an adjunct at one or more of the participating units.

Application forms and further information can be obtained by writing directly to any of the participating institutes or departments, or the program coordinator.

#### Requirements

The requirements for admission to the master's in the Collaborative Program in Bioinformatics are as follows:

- prior admission to the master's program in one of the supporting units participating in the program.
- a letter of recommendation from the participating faculty member of the Collaborative Program, which both recommends admission and indicates the willingness of the faculty member to supervise the candidate's research program in Bioinformatics.

#### Program Requirements

The student is responsible for fulfilling both the participating unit requirements for the Master's degree, and the requirements of the Collaborative Program.

The minimum requirements of the collaborative program include successful completion of two required courses, and a master's thesis on an approved bioinformatics topic.

Required courses:

- 0.5 credit in BIOL 5515 Bioinformatics
- 0.5 credit in BIOL 5517 Bioinformatics Seminar
- Thesis - candidates must successfully complete a research thesis on a topic in bioinformatics supervised by a faculty member of the Collaborative Program in Bioinformatics.

#### Notes:

1. Students in programs in Biology, Computer Science, Mathematics & Statistics may use BIOL 5515 Bioinformatics to count towards degree requirements; BIOL 5517 Bioinformatics Seminar must be taken in addition to the regular seminar course.
2. In addition, the student's thesis committee or advisory committee may direct the student to take or audit further courses to complement the student's background and research program.

#### Other Related Courses

Course descriptions may be found in the respective courses section.

BIOL 5105 (BIO 5302)	Methods in Molecular Genetics
BIOL 5201 (BIO 8301)	Evolutionary Genetics and Computer Analysis
BIOL 5409 (BIO 5306)	Mathematical Modeling for Biologists
BIOL 5500 (BIO 5207)	Selected Topics
BIOL 5501 (BIO 8100)	Selected Topics in Biology I
BIOL 5502 (BIO 8102)	Selected Topics in Biology II
BIOL 5516	Applied Bioinformatics
COMP 5105 (CSI 5132)	Parallel Processing Systems
COMP 5306 (CSI 5100)	Data Integration
COMP 5307 (CSI 5101)	Knowledge Representation
COMP 5704 (CSI 5131)	Parallel Algorithms and Applications in Bioinformatics
COMP 5703 (CSI 5163)	Algorithm Analysis and Design



COMP 5108 (CSI 5126)	Algorithms in Bioinformatics
COMP 5709 (CSI 5165)	Combinatorial Algorithms
COMP 5706 (CSI 5387)	Data Mining and Concept Learning
STAT 5708 (MAT 5170)	Probability Theory
STAT 5709 (MAT 5171)	Probability Theory II
STAT 5703 (MAT 5181)	Data Mining I
STAT 5702 (MAT 5182)	Modern Applied/ Computational Statistics
STAT 5600 (MAT 5190)	Mathematical Statistics I
STAT 5501 (MAT 5191)	Mathematical Statistics II
MATH 6508 (MAT 5314)	Topics in Probability and Statistics
MATH 6507 (MAT 5319)	Topics in Probability and Statistics
SYSC 5104 (ELG 6114)	Methodologies for Discrete-event Modeling and Simulation

## Biology

Department of Biology  
207 Nesbitt Building  
Tel.: 613-520-2600 ext. 8814  
carleton.ca/biology

- M.Sc. Biology
- M.Sc. Biology with Specialization in Behavioural Neuroscience (listed under Neuroscience)
- M.Sc. Biology with Specialization in Bioinformatics (listed under Bioinformatics)
- M.Sc. Biology with Specialization in Chemical and Environmental Toxicology (listed under Chemical and Environmental Toxicology)
- Ph.D. Biology
- Ph.D. Biology with Specialization in Behavioural Neuroscience (listed under Neuroscience)
- Ph.D. Biology with Specialization in Chemical and Environmental Toxicology (listed under Chemical and Environmental Toxicology)

### M.Sc. Biology

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

An Honours B.Sc. or equivalent degree at a standard acceptable to the two universities is required for admission to the M.Sc. program.

Applicants with acceptable standing in a non-honours degree may be admitted to a qualifying-year program which will be determined in each case by the admissions committee.

Applicants must demonstrate a fluent knowledge of English (Carleton), or either English or French (Ottawa).

#### Program Requirements

The M.Sc. degree will be conferred upon a candidate who has fulfilled the following requirements:

- Completion of the graduate courses specified by the student's advisory committee and the director or associate director of the OCIB; these are normally two one-term courses, but additional courses may be required, depending on the background and research program of the student.
- The passing grade for all required courses is 70% or the equivalent, and the student is not allowed a supplemental examination.
- The admissions committee or the student's advisory committee may also direct the student to take or to audit additional courses. Knowledge of a second language may be specified as a requirement.
- Completion of at least two terms as a full-time student resident at one of the two universities is normally required. Programs for part-time students may be arranged.
- Presentation of one public seminar on the candidate's thesis research.
- Completion of a thesis incorporating the results of original research carried out under the direct supervision of an approved faculty member.
- Successful oral defence of the thesis before an examination board of at least four faculty members, normally drawn from both universities.

### Guidelines for Completion of Master's Degree

The maximum time limits for the completion of the requirements of the master's program are listed in the General Regulations, Section 13 of this Calendar. Full-time candidates in the master's program are expected to complete their degree requirements within six terms of first registration for full-time study. Part-time candidates in the master's program, and candidates who elect to complete their program by a combination of full-time and part-time study, are expected to complete their degree requirements within four calendar years or twelve terms from the initial registration in the master's program.

### Ph.D. Biology

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

An M.Sc. from a recognized university is required for entry to the Ph.D. program.

A student already registered for the M.Sc. may be permitted to transfer to the Ph.D. program following a recommendation by the departmental graduate committee and successful completion of the Qualifying Examination required of Ph.D. candidates.

All applicants must demonstrate a fluent knowledge of English (Carleton), or either English or French (Ottawa).

#### Program Requirements

The Ph.D. degree will be conferred upon a candidate who has fulfilled the following requirements:

- Completion of the graduate courses specified by the student's advisory committee and the director or associate director of the OCIB; these will normally be two one-term courses (four one-term courses if transferred to the Ph.D. program without completing the M.Sc.).
- Only graduate courses may form part of the candidate's course requirements.
- The passing grade for all required courses is 70%, and the student is not allowed a supplemental examination.
- The admissions committee or the student's advisory committee may also direct the student to take or to audit additional courses. Knowledge of a second language may be specified as a requirement.
- Scheduling of an oral Qualifying Examination within approximately 12 months of entry into the program and completion normally within 18 months; this examination will cover the candidate's area of research, and related topics. The format of the examination will be established by the departmental graduate committee. The examination committee generally will be composed of faculty members of both universities.
- Presentation of at least one public seminar on the candidate's thesis research.
- A thesis incorporating the results of original research carried out under the direct supervision of an approved faculty member.
- Completion of at least four terms as a full-time student resident at one of the two universities (or six terms if transferred from an M.Sc.) is required. Under exceptional conditions programs may be arranged for part-time students.

- Successful oral defence of the thesis before an examination board of at least five faculty members, with representation from both universities, and including an external examiner from outside the two universities who is an authority on the thesis research area.

**Guidelines for Completion of the Doctoral Degree**

The maximum time limits for the completion of the program requirements of the doctoral program are listed in the General Regulations, Section 13 of this Calendar. Full-time candidates in the doctoral program are expected to schedule their oral Qualifying Examination within approximately 12 months of entry into the program, and to complete it within 18 months of entry into the program. Part-time candidates in the doctoral program are expected to schedule their oral Qualifying Examination within approximately 18 months after entry into the program. Full-time candidates are expected to complete their degree requirements within 4 calendar years or 12 terms of registered full-time study. Doctoral candidates who have transferred from the master's to the doctoral program without completing the master's program are expected to complete their degree requirements within 4 calendar years or 12 terms of registered full-time study from initial registration in the master's program. Part-time candidates in the doctoral program, and candidates who elect to complete their program by a combination of full- and part-time study, are expected to complete their degree requirements within 6 calendar years or 18 terms after the date of initial registration.

## Biomedical Engineering

Ottawa-Carleton Institute for Biomedical Engineering  
Carleton University  
Rm. 3090 Minto Centre  
Tel.: 613-520-5659  
www.ocibme.ca

- M.A.Sc. Biomedical Engineering

### M.A.Sc. Biomedical Engineering

#### About the Program

The Ottawa-Carleton Institute for Biomedical Engineering (OCIBME) offers a multi-disciplinary Masters of Applied Science degree (M.A.Sc.) in biomedical engineering. The main objective is to enhance students' abilities to solve biological and medical problems through the application of engineering principles. This objective is achieved through a combination of graduate course work, directed and individual study, research thesis work, and various forms of oral and written presentations. OCIBME welcomes applicants from a wide variety of academic backgrounds, including: engineering, science, computer science, biomedical sciences, health sciences, or a related discipline. Within biomedical engineering, the program has four main research areas: Medical Instrumentation, Biomedical Image Processing, Biomechanics and Biomaterials, and Medical Informatics and Telemedicine.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission is a four-year bachelor's degree in engineering, science, computer science, or a related discipline, with an average of at least B+.

#### Program Requirements

All master's students must successfully complete a total of 5.0 credits, which includes a 2.5 credit master's thesis. Courses must be selected with the approval of the student's supervisor. The specific requirements are:

- 0.5 credit compulsory course BIOM 5010
- 1.0 credit (or the equivalent) of two biomedical engineering graduate level courses BIOM (BMG)
- 1.0 credit (or the equivalent) from graduate level courses offered at either Carleton University or University of Ottawa
- 2.5 credit thesis BIOM 5909 (BMG 5909)
- Biomedical Engineering Seminar course BIOM 5800 (BMG 5800) (0.0 credit)

#### Course Selection

Students in this program may choose elective graduate courses from either university, with the approval of their program advisor. All courses are 0.5 credit (one term's duration) with the exception of BIOM 5800 (BMG 5800) (0.0 credits) and BIOM 5909 (BMG 5909) (2.5 credits). Only a selection of courses listed is given in a particular academic year. For information on courses offered in a given year please consult the Institute's web site (www.ocibme.ca).

#### Notes:

University of Ottawa course numbers are in parentheses.

Consult the Biomedical Engineering (BIOM) courses page for full course descriptions. The course descriptions for other courses are listed in the calendar under the department offering the course.

Given that the students admitted to this program are from different academic backgrounds, any elective course listed in this program can only be taken by qualified students who satisfy the prerequisites.

## Biostatistics

School of Mathematics and Statistics  
HP 4302  
Tel: 613-520-2155  
www.mathstat.carleton.ca

- **M.Sc. Mathematics: Specialization in Biostatistics**  
(Collaborative program)

### M.Sc. Mathematics: Specialization in Biostatistics (Collaborative program)

#### About the Program

The Specialization in Biostatistics is an interdisciplinary area of research linking statistics, biology, medicine, and health sciences. The specialization is intended to prepare a student for a career as a biostatistician in a health-related industry, or for a doctoral program in biostatistics.

The program is administered by a committee of representatives from the primary departments, which include the Department of Epidemiology and Community Medicine at the University of Ottawa, the Department of Mathematics and Statistics at Carleton University and the Department of Mathematics and Statistics at the University of Ottawa. Application is made to the primary department most appropriate to the student's research interests. The title of the degree will specify the discipline of the participating unit with specialization in biostatistics.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

Honours B.Sc. with high honours standing (or the equivalent) in statistics and experience in the analysis of data. Students in this stream follow a program with an emphasis in clinical trial design or epidemiologic methodology.

Students should normally apply for acceptance in the Specialization in Biostatistics at the same time as they apply for admission into the master's program in Mathematics. If accepted into the regular program, the student will then be considered by the program coordinators for admission into the Specialization.

Students intending to apply for admission to the Specialization should normally contact prospective thesis supervisors before submitting the application and establish a thesis supervisor and research topic.

#### Program Requirements

##### Master's degree by thesis:

- 3.5 credits
- 0.5 credit in STAT 5902 (MAT 5992) Seminar in Biostatistics
- A thesis equivalent to 1.0 credit

##### Master's degree by course work:

- 4.5 credits
- 0.5 credit in STAT 5902 (MAT 5992) Seminar in Biostatistics

Unless prior approval by the Director of the collaborative program has been obtained, students in the M.Sc. Mathematics program should take EPI 5240, EPI 5241, EPI 6178, EPI 6278, STAT 5600 (MAT 5190) or STAT 5610 (MAT 5375), and STAT 5501 (MAT 5191) or STAT 5602 (MAT 5317). The remaining courses should be in Mathematics and Statistics at

the graduate level. The degree awarded will in each case specify the discipline of the participating unit with Specialization in Biostatistics.

Most of the program requirements must be fulfilled in English. Students may write papers, submit theses and write examinations in both English and French.

#### Thesis

The thesis may contain new research in the area of mathematics and statistics or provide a review of the literature in one area. The thesis normally will be on statistics applied to health or biology; for example, the development of a new statistical procedure, the design of a new experiment or the analysis of data. The thesis should extend beyond the routine analysis of data. The supervisor and other members of the examination board may be drawn from faculty members in either epidemiology or mathematics and statistics or in other related departments.

#### Related Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings and to determine the term of offering, visit central.carleton.ca. University of Ottawa course numbers (in parentheses, three letters followed by four numbers) follow the Carleton course number. Consult the relevant courses section for a full description of each course.

#### Biostatistics

STAT 5902 - Seminar in Biostatistics

#### Mathematics, Statistics

- MATH 5909 (MAT 7999)
- STAT 5501 (MAT 5191)
- STAT 5600 (MAT 5190)
- STAT 5602 (MAT 5317)
- STAT 5610 (MAT 5375)
- STAT 5902 (MAT 5992)

#### Epidemiology

- EPI 5240 Epidemiology I
- EPI 5241 Epidemiology II
- EPI 5330 Vital and Health Statistics
- EPI 6178 Clinical Trials
- EPI 6278 Advanced Clinical Trials



## Business

Sprott School of Business  
710 Dunton Tower  
Telephone: 613-520-2388  
sprott.carleton.ca

- Master of Business Administration
- Ph.D. Management

### Master of Business Administration

#### About the Program

The Sprott MBA is a professional degree designed for those who would like to develop their expertise and improve their management knowledge and skills. The Sprott MBA is market driven and currently focuses in the areas of financial management, international business, international development management, management accounting, management and change, and technology management. The MBA program consists of a set of compulsory core courses, a concentration and a set of elective courses.

The MBA can be completed on a full time or part time basis, depending on the concentration selected. The part time stream is limited to those with 2 years or more of professional experience. The fulltime stream requires completion of a mandatory internship for those with less than two years of professional experience.

Every instructor in the Sprott MBA has previous significant management or consulting experience outside the university. The courses and course pedagogy are highly applied, using case studies of actual corporations and industries. While working within small teams, the emphasis is on the diagnosis of problems, identification of strategic options and solutions.

#### Academic Regulations

See the General Regulations section of this Calendar.

Academic standing: a grade of B- or better is normally required in each credit counted towards the degree. However, a candidate may, with the recommendation of the School and the approval of the Dean of the Faculty of Graduate and Postdoctoral Affairs, be allowed to count a grade of C+ in two quarter-credit courses (or the equivalent, i.e. 0.5 credit).

An M.B.A. student will be required to withdraw from the program if:

- a grade of lower than B- is received in three or more quarter-courses (or the equivalent, i.e. 0.75 credit)
- a grade lower than B- is received in the same course more than once

#### Admission Requirements

- Applicants are expected to hold an Honours bachelor's degree or equivalent, with a minimum overall average of B.
- The Sprott School requires that all applicants submit a GMAT with a minimum score of 550 obtained in the Graduate Management Admission Test (GMAT) offered by Pearson Vue, Bloomington, MN.
- Proficiency in English is necessary to pursue graduate studies at Carleton University. See Section 3.6 of the General Regulations of this Calendar for English proficiency rules.

#### Notes:

1. Admission is judged primarily on the applicant's ability to successfully undertake advanced study in management based on his/her work experience and achievement, GMAT score and undergraduate grades. Possession of the minimum admission requirements does not, in itself, guarantee acceptance.
2. As the M.B.A is a professional degree, advanced standing for previous course work is not granted.

#### Program Requirements

The full-time stream is designed to be completed in four terms (including the internship).

The part-time stream is open only to applicants with a minimum of two years professional experience and is designed to be completed in three years of part-time study.

Further details on program timing are provided in the General Regulations section of this Calendar, under Time Limits for Program Completion, Section 13.2.

Attendance and completion of M.B.A. Orientation Week at the beginning of the fall term of admission is a mandatory M.B.A. degree requirement for students having less than two years of professional work experience. Professional work experience must be verified by the School. Further details are available at [sprott.carleton.ca/mba](http://sprott.carleton.ca/mba)

Courses are 0.25-credit/quarter-credit (six weeks), or 0.5 credit/half-credit, 12 weeks.

All students must successfully complete 4.25 credits of compulsory core courses, 2.25 credits from one program concentration and 1.0 credit of elective courses.

Before students take concentration courses, they must have successfully completed the relevant core courses.

The remaining elective credits may be selected from any of the other concentration courses listed below (see below for certain exceptions).

Students having less than two (2) years of professional employment experience must successfully complete BUSI 5999 [1.0 credit] Internship in order to graduate. Details and requirements for the internship are available from the School.

#### Concentrations in the MBA Program

- Financial Management
- International Business
- International Development Management
- Management Accounting (constitutes partial completion of the requirements for the Certified Management Accounting (CMA) designation, by agreement with the Society of Management Accountants of Ontario)
- Management and Change
- Technology Management

#### M.B.A. Program Structure and Variations

1. **M.B.A. with one concentration (8.5 credits for full-time stream, 7.5 credits for part-time stream)**
  - 4.25 compulsory core credits
  - 2.25 credits in the chosen concentration
  - 1.0 credit of elective courses from one or more of the other concentrations
  - 1.0 credit in BUSI 5999 Internship. Students with less than two (2) years of professional employment experience must successfully complete the Internship in order to graduate. Details and requirements for the internship are available from the School. Students in the part-time stream are exempt from taking BUSI 5999 Internship.

**1.1 Variations**

**i. Concentration in Management Accounting (7.5 credits). Available in the part-time stream only.**

**ii. International Development Management (8.5 credits for full-time stream, 7.5 credits for part-time stream)**

- 4.25 credits of core courses. However, core courses ITIS 5403, TOMS 5303 and TOMS 5304 (see below) must be taken by IDM students in place of ITIS 5401, TOMS 5301 and TOMS 5302.
- 2.25 credits of concentration courses consisting of 1.5 credits of IDMG courses offered by the Norman Paterson School of International Affairs (NPSIA), School of Public Policy & Administration (SPPA) and 0.75 credits in the Sprott School of Business as specified below.
- 1.0 credit of elective courses selected from a list of specific IDMG courses.
- 1.0 credit in BUSI 5999 Internship for students having less than two (2) years of professional employment experience.
- IDM students may not take electives in other concentration courses.
- IDMG courses are not open to students in other concentrations.

**2. M.B.A. with one concentration plus a minor concentration (8.5 credits for full-time stream, 7.5 credits for part-time stream)**

- 4.25 compulsory core credits
- 2.25 credits in a chosen concentration
- 1.0 credit in a second, minor concentration with the exception of the International Development Management Concentration. See the lists under Minor Concentration in the next section for specific course requirements.
- 1.0 credit in BUSI 5999 Internship for students having less than two (2) years of professional employment experience.

**3. M.B.A. with two concentrations (9.75 credits for full-time stream, 8.75 credits for part-time stream, see Note below)**

- 4.25 compulsory core credits
- 2.25 credits in each of two concentrations with the exception of the International Development Management Concentration.
- 1.0 credit in BUSI 5999 Internship for students having less than two (2) years of professional employment experience.

Note: the two concentrations option above includes an additional 1.25 credits (5 quarter-courses) to fulfil degree requirements.

**M.B.A. Course Categories**

**M.B.A. Compulsory Core Courses**

All MBA courses are 0.25 credit unless otherwise noted.

ACCT 5001	Financial Accounting
ACCT 5002	Managerial Accounting
BUSI 5801	Statistics for Managers
BUSI 5802	Business Ethics
BUSI 5803	Managerial Economics
FINA 5501	Financial Management
FINA 5502	Corporate Finance
IBUS 5701	International Business
ITIS 5401	Fundamentals of IT Service Management
MGMT 5100	Managing People and Organizations (0.5 credit)
MGMT 5200	Marketing Strategy (0.5 credit)
MGMT 5101	Managing People
MGMT 5102	Managing Organizations
MKTG 5201	Marketing Strategy Formulation
MKTG 5202	Marketing Strategy Implementation

TOMS 5301	Modeling Business Decisions
TOMS 5302	Operations Management
STGY 5900	Corporate and Business Strategy (0.5 credit)
STGY 5901	Corporate and Business Strategy
STGY 5902	Strategic Management Capstone Project

**For Students in International Development Management Concentration Only:**

ITIS 5403	ICT for Development
TOMS 5303	Managing Projects
TOMS 5304	Logistics and Supply Chain Management

**M.B.A. Concentration Courses**

**Concentration in Financial Management**

ACCT 5011	Financial Statement Analysis
ACCT 5012	Performance Measurement and Control
ACCT 5013	Public Sector and NGO Accounting
ACCT 5014	Financial Corporate Governance and Accountability
FINA 5511	Investments
FINA 5512	Valuation
FINA 5513	Mergers and Acquisitions
FINA 5514	International Finance
FINA 5521	Financial Management Concentration Integration

**Concentration in Management Accounting**

All MBA courses are 0.25 credit unless otherwise noted.

ACCT 5020	Intermediate Financial Accounting (0.5 credit)
ACCT 5021	Advanced Financial Accounting (0.5 credit)
ACCT 5022	Intermediate Management Accounting (0.5 credit)
ACCT 5023	Advanced Management Accounting (0.5 credit)
ACCT 5014	Financial Corporate Governance and Accountability

**Concentration in Management and Change**

MGMT 5111	Conflict and Negotiation
MGMT 5112	Power and Influence
MGMT 5113	Managing Teams
MGMT 5114	Managing Diversity
MGMT 5115	Leadership
MGMT 5116	Managing Performance
MGMT 5117	Knowledge Management
MGMG 5120	Fundamentals of Leading and Managing Organizational Change

**Concentration in Technology Management**

ITIS 5411	IT Service Support
ITIS 5412	IT Service Delivery
ITIS 5413	Enterprise Architecture and Governance
TOMS 5311	Quality Management
TOMS 5312	Technology Development
TOMS 5313	Technology Adoption for Services
TOMS 5314	Supply Chain Management
MKTG 5211	Technology Marketing
ITIS 5421/ TOMS 5321	Strategic Management of Technology Concentration Integration

**Concentration in International Business**

IBUS 5711	International Marketing and Trade
IBUS 5712	Business and Government in Emerging Economies
IBUS 5713	Doing Business in the United States
IBUS 5721	Regional and Global Business Strategies Concentration Integration
FINA 5512	Valuation
FINA 5513	Mergers and Acquisitions
MGMT 5114	Managing Diversity

Programs - Business

MGMT 5117 Knowledge Management  
TOMS 5314 Supply Chain Management

**Concentration in International Development Management**  
All MBA courses are 0.25 credit unless otherwise noted.

IBUS 5712 Business and Government in Emerging Economies  
MGMT 5115 Leadership  
ITIS 5414 Emerging Information Technologies and Business Innovation  
IDMG 5600 Human Resource Development (0.5 credit)  
IDMG 5603 National and Domestic Dimensions of Development (0.5 credit)  
IDMG 5615 Civil Society Organizations and Development (0.5 credit)

**International Development Management Concentration Electives**  
All MBA courses are 0.25 credit unless otherwise noted.

IDMG 5601 Conflict and Development (0.5 credit)  
IDMG 5602 Issues in International Development (0.5 credit)  
IDMG 5604 Human Security: From Policy to Practice (0.5 credit)  
IDMG 5605 Human Rights: International Politics and Policies (0.5 credit)  
IDMG 5606 Agriculture and Rural Development (0.5 credit)  
IDMG 5607 Global Health Policy (0.5 credit)  
IDMG 5609 International Aspects of Economic Development (0.5 credit)  
IDMG 5616 Program Evaluation in Developing Countries (0.5 credit)  
IDMG 5617 Health Policy in Developing Countries (0.5 credit)  
IDMG 5619 Rights, Development, and Conflict (0.5 credit)  
IDMG 5620 Development Assistance: Theory and Practice (0.5 credit)

**Minor Concentration Courses**

**Minor Concentration in Financial Management**

If taken with:  
**Concentration in Technology Management or Concentration in Management and Change**  
ACCT 5011 Financial Statement Analysis  
ACCT 5012 Performance Measurement and Control  
FINA 5512 Valuation  
FINA 5513 Mergers and Acquisitions

If taken with:  
**Concentration in International Business**  
ACCT 5011 Financial Statement Analysis  
ACCT 5012 Performance Measurement and Control  
FINA 5511 Investments  
FINA 5514 International Finance

**Minor Concentration in Management and Change**  
MGMT 5113 Managing Teams  
MGMT 5115 Leadership  
MGMT 5121 Fundamentals of Organizational Change  
MGMT 5122 Leading and Managing Organizational Change

**Minor Concentration in Technology Management**  
Students with a minor concentration in Technology Management must select the equivalent of 1.0 credit (or equivalent) from the Technology Management concentration courses. ITIS 5421/TOMS 5321 Strategic Management of Technology (Concentration

Integration Course) may not be used to fulfil this requirement.

**Minor Concentration in International Business**  
IBUS 5711 International Marketing and Trade  
IBUS 5712 Business and Government in Emerging Economies  
IBUS 5713 Doing Business in the United States  
IBUS 5721 Regional and Global Business Strategies (Concentration Integration course)

**Ph.D. Management**

**Academic Regulations**  
See the General Regulations section of this Calendar.

**Academic Standing:** Doctoral students must normally obtain a grade of B- or better in each credit, and Satisfactory on the comprehensive examinations, the Ph.D. thesis and its oral defence.

**Admission Requirements**

Admission into the Ph.D. program will be judged primarily on the applicant's ability to undertake research successfully and his/her prospects for completion of the program.

The normal requirement for admission to the doctoral program in management is a master's degree (or equivalent) in business or a related field with an A- average. A number of years of work experience is desirable.

A student enrolled in the M.B.A. program (or a similar research-based master's program in business) who has completed a minimum of 2.5 credits and who has shown outstanding academic performance and research promise may be admitted to the Ph.D. program without completing the master's program. Normal Ph.D. program requirements, as stated below, will apply. Each case will be considered on an individual basis for advanced standing in the Ph.D. program. Advanced standing will be considered for a maximum of 1.5 credits.

Applicants who have completed a thesis-based master's program in business or a related area may have their program requirements, as set out below, adjusted at the time of admission.

All Ph.D. candidates, regardless of their previous field of specialization, are expected to have or to acquire a basic knowledge of statistics and at least two of the following areas of management: finance, marketing, organizational behaviour, management science, information systems, and productions/operations management. Students will be admitted to the program with a course of study designed where appropriate to supplement previous education, experience, and training.

Graduate Management Admission Test (GMAT) - the School requires that all applicants submit scores obtained in the Graduate Management Admission Test (GMAT) offered by the Education Testing Service of Princeton, New Jersey. Successful candidates will normally have a GMAT score of at least 600.

All applicants whose native tongue is not English must be tested for proficiency in the English language and obtain a minimum score of 550 on the TOEFL, or its equivalent. See Section 3.6 of the General Regulations section of this Calendar for details.



**Program Requirements**

The degree will normally be pursued on a full-time basis for the first two years.

The program requirements for the Ph.D. in Management are:

10.0 credits comprised of:

- 1.5 credits in research and analysis methods;
- 1.5 credits of seminar courses in functional areas of business
- 1.0 credit from a selection of advanced course electives in the School of Business
- 1.0 credit of free electives which must be approved by the thesis supervisor
- A thesis normally equivalent to 5.0 of the 10.0 required credits, which must be defended at an oral examination;
- One written and one oral comprehensive examination;
- Participation in the Sprott School of Business research seminar series on current business issues for one year;
- Participation in the Sprott School of Business seminar series on, and classroom experience in, teaching methods;
- Presentation and oral defence of the thesis proposal.

**Course Requirements**

All students in the doctoral program are required to complete successfully:

The following 0.5-credit courses:

- BUSI 6902, BUSI 6907 and one of BUSI 6905 or BUSI 6906
- 1.5 credits of advanced seminars including at least one two-course sequence, from the following doctoral seminar courses: BUSI 6100 and BUSI 6101; BUSI 6200 and BUSI 6201; BUSI 6300 and BUSI 6301; BUSI 6400 and BUSI 6401; BUSI 6500 and BUSI 6501;
- 1.0 credit from the following advanced seminars: BUSI 6701, BUSI 6702, BUSI 6703, BUSI 6704, BUSI 6801, BUSI 6802, BUSI 6803, BUSI 6804, BUSI 6805

Students are strongly encouraged to complete 0.5 credit from BUSI 6701, BUSI 6702, BUSI 6703, or BUSI 6704, a series of courses which focuses on the dimensions of complex problem representation and analysis. Students are also strongly encouraged to complete 0.5 credit from BUSI 6801, BUSI 6802, BUSI 6803, BUSI 6804, or BUSI 6805, a series of courses oriented to specific management issues.

The remaining 1.0 credit elective, chosen with the approval of the thesis supervisor to assist in the thesis research process, normally will be chosen from either those courses at the 5000- or 6000-level in the School of Business listed above, or from outside the School in a supporting discipline or in the area of statistics.

**Comprehensive Examinations**

All Ph.D. candidates are required to successfully complete one written and one oral examination. The written examination will consist of a major essay that provides a comprehensive analytical review of the literature in an area of the student's specialization. The issues dealt with in the essay will be distinct from the student's thesis topic. The submission of the essay will be followed within three to four weeks by a comprehensive oral examination. In

addition to questions based on the written portion, the oral comprehensive will include questions on peripheral topics previously assigned by the student's comprehensive examination committee.

The comprehensive examinations must be completed successfully before the Ph.D. proposal defence is scheduled. In normal circumstances, the oral defence must occur within four calendar terms of the student's initial registration in the Ph.D. program. Students who do not fulfil this requirement may be asked to withdraw from the program.

**Thesis**

All Ph.D. candidates are required to complete successfully a thesis normally equivalent to a minimum of 5.0 credits on a topic approved by the School. Students with appropriate background will be reviewed for possible adjustment of thesis weight.

## Canadian Studies

School of Canadian Studies

1206 Dunton Tower

Tel.: 613-520-2366

carleton.ca/cdnstudies

- M.A. Canadian Studies
- Ph.D. Canadian Studies
- Collaborative Ph.D. with Specialization in Political Economy (Specialization requirements listed under Political Economy)

### M.A. Canadian Studies

#### Admission Requirements

Applicants are required to hold an Honours B.A. (or the equivalent), with at least high honours standing.

#### Qualifying Year

Applicants who do not qualify for direct admission to the master's program may, in exceptional cases, be admitted to a qualifying-year program. However, admission to the qualifying-year program does not imply automatic admission to the master's program. At the end of the qualifying-year program the student will be required to apply for entry into the master's program, at which time the School will determine the student's eligibility to enter the program.

#### Proficiency in English

Proficiency in English is necessary to pursue graduate studies at Carleton University. All applicants whose first language is not English must satisfy this requirement by presenting a TOEFL score of 600 or higher.

Language Requirement - The School requires a reading knowledge of French. This is a program requirement and not an admission requirement. This requirement may be satisfied in the following ways:

- Successful completion of FINS 3105 or its equivalent (with a grade of B- or better).
- Successful completion of a French language examination.
- Alternatively, a student may fulfil this requirement with a demonstrated knowledge of an Aboriginal language.
- The School conducts the French language examinations in September and January. Students choosing the first option should note that examination results in these courses form part of their record, although they are additional to the course requirements for the degree.

#### Program Requirements

The minimum requirements for the master's program are outlined in the General Regulations section of this Calendar. The School of Canadian Studies specifies that all candidates must select one of the following three program patterns:

- 4.0 credits of coursework
- 3.0 credits plus a 1.0 credit Research Essay
- 2.0 credits plus a 2.0 credit Thesis

Students must declare their option as coursework, thesis, or research essay no later than the end of the second term of registration for students enrolled full-time, and no later than the end of the fifth term of registration for students enrolled part-time. For students beginning their program in September the deadline is the following April 30, and for students starting in January the deadline is the following August 31.

#### Coursework Option

- 0.5 credit in CDNS 5001 M.A. Core Seminar: Conceptualizing Canada
- 1.0 credit chosen from: CDNS 5101, CDNS 5102, CDNS 5201, CDNS 5202, CDNS 5301, CDNS 5302, CDNS 5401, CDNS 5402, CDNS 5501, CDNS 5601
- An additional 2.5 credits chosen from the courses listed above, or CDNS 5800, CDNS 5801, CDNS 5900, CDNS 5901, or an approved course listed in the Selection of Courses

#### Research Essay Option

- 1.0 credit in M.A. Research Essay CDNS 5908
- 0.5 credit in CDNS 5001 M.A. Core Seminar: Conceptualizing Canada
- 1.0 credit chosen from: CDNS 5101, CDNS 5102, CDNS 5201, CDNS 5202, CDNS 5301, CDNS 5302, CDNS 5401, CDNS 5402, CDNS 5501, CDNS 5601
- An additional 1.5 credits chosen from the courses listed above, or CDNS 5801 or CDNS 5901, or an approved course listed in the Selection of Courses

#### Thesis Option

- 2.0 credits in M.A. Thesis CDNS 5909 [2.0 credits]
- 0.5 credit in CDNS 5001 M.A. Core Seminar: Conceptualizing Canada
- 1.0 credit chosen from: CDNS 5101, CDNS 5102, CDNS 5201, CDNS 5202, CDNS 5301, CDNS 5302, CDNS 5401, CDNS 5402, CDNS 5501, CDNS 5601
- An additional 0.5 credit chosen from the courses listed above, or CDNS 5901, or an approved course listed in the Selection of Courses

#### Thesis/Research Essay Proposal

At the time of declaring their option, thesis/research essay students are encouraged to declare a preliminary topic and tentative list of potential supervisors. Thesis/research essay students must submit a research proposal to the School that has been approved by their thesis/research essay supervisor prior to registering in the M.A. Research Essay (CDNS 5908) or the M.A. Thesis (CDNS 5909).

### Ph.D. Canadian Studies

#### About the Program

The doctoral program is offered jointly by the School of Canadian Studies at Carleton University and the Frost Centre for Canadian Studies and Native Studies at Trent University. The program of courses and thesis guidance, drawing upon the faculty of the two academic units and universities, will encompass course requirements, comprehensive examinations, and a thesis.

#### Fields of Study:

- Culture, Literature, and the Arts
- Environment and Heritage
- Policy, Economy and Society
- Identities
- Women's Studies

#### Academic Regulations

See the General Regulations section of this Calendar.

Academic Standing - All Ph.D. candidates must obtain at least B+ standing or better (GPA 9.0) in each course counted towards the degree. Comprehensive examinations (which will be graded on a Satisfactory, Unsatisfactory or Pass with Distinction basis) are exempted from this required standing.

#### Admission Requirements

Master's degree (or equivalent), with at least high honours standing in Canadian Studies or one of the disciplines represented in the School. Applicants

should note, however, that meeting the admission requirement does not guarantee admission to the program.

The Ph.D. program in Canadian Studies normally will be undertaken on a full-time basis. In cases of exceptional merit, the School will accept a few candidates for the degree on a part-time basis.

**Language Requirement** - All doctoral students are required to pass the Ph.D. program's language test. The language test entails the translation into English of a French text (or a text in another approved language such as an Aboriginal language indigenous to Canada or another language if it is demonstrably relevant to their research interest). The language test is two hours long, and students are permitted to use a dictionary. Grades for the language test are Pass or Fail.

Students who have taken a language test as a requirement for their M.A. cannot use it to meet the Ph.D. language requirement. In order to establish equal treatment of all students, all doctoral candidates will be required to pass the Ph.D. language test.

#### **Program Requirements**

Doctoral candidates must successfully complete 10.0 credits. Candidates with deficiencies in certain areas may be admitted to the Ph.D. program, but normally will be required to complete additional work. The specific requirements are as follows:

- 1.0 credit for successful completion of CDNS 6900, the mandatory core seminar;
- 1.0 credit for successful completion of two courses or tutorials (or the equivalent) drawn from the graduate list offered by the School, below, with one 0.5-credit course drawn from each of the candidate's two major fields of study; a GPA of 9.0 or better must be obtained in these courses for students to be allowed to proceed to the comprehensive examinations;
- 1.0 credit for successful completion of two 0.5-credit written comprehensive examinations. Students will be examined in two fields;
- Satisfactory demonstration of an understanding of a language other than English. Although French is the preferred second language, students may be permitted to substitute an Aboriginal language indigenous to Canada or another language if it is demonstrably relevant to their research interests;
- A public defence, in English, of a written thesis proposal. Following the completion of their comprehensives, students will be expected to defend a proposal of the research and analysis they plan to undertake in completing their Ph.D. thesis. The thesis proposal defence should normally occur within six months after completion of a student's comprehensive examinations and within the first 27 months of registration in the program. The thesis committee will be composed of three faculty members, always including one from each university;
- A 7.0-credit thesis, which must be successfully defended in English at an oral examination.
- Comprehensive Examinations - Full-time students are expected to complete their comprehensive examinations within 24 months of their initial registration in the Ph.D. program. Part-time Ph.D. students should finish their comprehensive examinations within 36 months of completing course work. Both full-time and part-time students should complete their comprehensive examinations before defending their dissertation proposal.
- Candidates are required to take an oral examination after each written examination.

The fields of study for the Ph.D. comprehensive examinations are to be chosen from the following list:

#### **Culture, Literature, and the Arts**

A general knowledge of theories of culture in general, Canadian theoretical discourses on cultural practices, and on the interplay among theory, art, and literature, and their social contexts.

#### **Environment and Heritage**

A general knowledge of locality, landscape, environment and region in Canada.

#### **Policy, Economy and Society**

A general knowledge of the complex web of relationships linking economy, civil society, and public policy in Canada and their interaction within social, political, and cultural life.

#### **Identities**

A general knowledge of the character and experience of individual, collective and communal identities in Canada.

#### **Women's Studies**

A general knowledge of women's experiences of the major dynamics of social, political, economic and cultural development at all levels of Canadian life.

#### **Canadian Studies Courses at Carleton University by Fields of Study**

To meet program requirements Carleton students must take at least one of the 0.5 credit courses from the Canadian Studies courses listed below. Students can also choose from approved graduate courses at the Frost Centre for Canadian Studies and Native Studies at Trent University. Students should consult with the Graduate Studies Administrator for the complete listing of acceptable graduate courses available at Trent University in any given year.

#### **Culture, Literature, and the Arts**

CDNS 5301, CDNS 5302

#### **Environment and Heritage**

CDNS 5401, CDNS 5402

#### **Policy, Economy and Society**

CDNS 5302, CDNS 5501, CDNS 5601

#### **Identities**

CDNS 5101, CDNS 5102, CDNS 5501

#### **Women's Studies**

CDNS 5201, CDNS 5202, CDNS 5501

Students may also register in graduate courses offered outside Canadian Studies.

All graduate courses must be approved by the Ph.D. Coordinator in Canadian Studies at Carleton University.

## Chemical and Environmental Toxicology

Biology Department  
209 Nesbitt Building  
Tel.: 613-520-2478  
carleton.ca/biology

Chemistry Department  
203 Steacie Building  
Tel.: 613-520-2600 x 3523  
carleton.ca/chem

Department of Earth Sciences  
2125 Herzberg Building  
Tel: 613-520-5633  
earthsci.carleton.ca

### M.Sc. (Biology, Chemistry or Earth Sciences) with Specialization in Chemical and Environmental Toxicology

#### About the Program

Toxicology is the study of effects of toxic substances on living systems. These toxic substances can either be organic or inorganic, synthetic or natural materials. The study of toxicology crosses traditional disciplinary boundaries such as chemistry, biology, and the environmental sciences. Environmental toxicology further extends to aspects of chemical transport, fate, persistence and biological accumulation of toxic substances and their effects at the population and community levels. While individual researchers usually specialize in a particular area, toxicologists must be able to appreciate significant research in other fields and therefore require an understanding of the basic principles of other disciplines. To meet this challenge the University of Ottawa and Carleton University offer a Collaborative Program in the supporting Institutes leading to a M.Sc. with Specialization in Chemical and Environmental Toxicology.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

Applications should be directed to the primary participating unit that is the most appropriate to the student's research interests. Once sponsored and accepted into one of the Institutes, students must be sponsored into the Collaborative Program in Chemical and Environmental Toxicology by a faculty member involved in the program. This will normally be the student's supervisor.

The requirements for admission to the Master's in the Collaborative Program in Chemical and Environmental Toxicology are as follows:

1. Prior admission to the master's program in one of the supporting Institutes participating in the program.
2. Completion of a relevant introductory course in toxicology, either:
  - i. prior to admission to the Collaborative Program in Chemical and Environmental Toxicology, or
  - ii. by taking one of the two introductory courses, 'Principles of Toxicology' (BIOL 6402/BIO 9101 - CHEM 5708/CHM 8156) or 'Ecotoxicology' (BIOL 6403/BIO 9104 - CHEM 5705/CHM 9109), while registered in the Collaborative Program.

The suitability of any introductory toxicology courses as a prerequisite for the Collaborative Program will be decided by the executive committee. It may be the student's responsibility to provide justification for an exemption.

3. A letter of recommendation from the participating faculty member of the collaborative program, which both recommends admission and indicates the willingness of the faculty member to supervise the candidate's research program in Chemical and/or Environmental Toxicology.

#### Program Requirements

The student is responsible for fulfilling both the Institute and departmental requirements for the Master's degree, and the requirements of the Collaborative Program.

The minimum requirements of the Collaborative Program include completing at least three courses, which include:

1. The introductory course (if required);
2. Additional courses required by the Master's Program and approved by the Collaborative Program;
3. The Seminar in Toxicology (BIOL 6405/BIO 9105 - CHEM 5805/CHM 8167).

In addition, the student's Institute Committee or Advisory Committee may direct the student to take or audit further courses to complement the student's background and research program.

Other courses offered in the programs of the primary academic units of biology or chemistry may be taken as options, with the permission of the student's supervisory committee, in addition to the basic requirements of Collaborative Program in Chemical and Environmental Toxicology.

Thesis Requirement - a research thesis on a topic in toxicology supervised by a faculty member of the Collaborative Program in Chemical and Environmental Toxicology.

### Ph.D. (Biology, Chemistry or Earth Sciences) with Specialization in Chemical and Environmental Toxicology

#### About the Program

Toxicology is the study of effects of toxic substances on living systems. These toxic substances can either be organic or inorganic, synthetic or natural materials. The study of toxicology crosses traditional disciplinary boundaries such as chemistry, biology, and the environmental sciences. Environmental toxicology further extends to aspects of chemical transport, fate, persistence and biological accumulation of toxic substances and their effects at the population and community levels. While individual researchers usually specialize in a particular area, toxicologists must be able to appreciate significant research in other fields and therefore require an understanding of the basic principles of other disciplines. To meet this challenge the University of Ottawa and Carleton University offer a Collaborative Program in the supporting Institutes leading to a Ph.D. with Specialization in Chemical and Environmental Toxicology.



**Academic Regulations**

See the General Regulations section of this Calendar.

**Admission Requirements**

Applications should be directed to the primary participating unit that is the most appropriate to the student's research interests. Once accepted and registered in one of the Institutes, students must be sponsored into the Collaborative Program in Chemical and Environmental Toxicology by a faculty member involved in the program; this will normally be the student's thesis supervisor. Application forms and further information can be obtained by writing directly to any of the participating Institutes or Departments or to the program Coordinator.

The requirements for admission to the Collaborative Program in Chemical and Environmental Toxicology at the Ph.D. level are as follows:

1. Prior admission to the Ph.D. program in one of the supporting Institutes participating in the program.
2. Completion of a relevant introductory course in toxicology, either
  - i. prior to admission to the Collaborative Program in Chemical and Environmental toxicology, or
  - ii. by taking one of the two introductory courses, Principles of Toxicology (BIOL 6402/BIO 9101/CHEM 5708/CHM 8156 [0.5 credit] or Ecotoxicology BIOL 6403/BIO 9104/CHEM 5705/CHM 9109/ (0.5 credit), while registered in the Collaborative Program. If the student wishes to be exempted from any introductory toxicology courses, it is the student's responsibility to provide justification. The suitability of any introductory toxicology courses as a prerequisite for the Collaborative Program will be decided by the Program Committee of the Program.
3. A letter of recommendation from a participating faculty member who is a member of the Collaborative Program, which both recommends admission and indicates the willingness of the professor to supervise the candidate's research program in Chemical and Environmental Toxicology.

**Program Requirements**

Students are responsible for fulfilling both the Institute and Departmental requirements for the Ph.D. degree, and the requirements of the Collaborative Program.

The requirements of the Collaborative Program are as follows:

1. All courses required by the primary program and approved by the Collaborative Program. If an introductory course (either Principles of Toxicology (BIOL 6402/BIO 9101/CHEM 5708/CHM 8156 [0.5 credit] (TOX 8156) or Ecotoxicology (BIOL 6403/BIO 9104/CHEM 5705/CHM 9109 [0.5 credit] , or an approved alternative) has not been completed prior to admission, it must be included among these courses.
2. The Seminar in Toxicology (BIOL 6405/BIO 9105 - CHEM 5805/CHM 8167 [0.5 credit] (see Note, below)
3. In addition, students may be directed by their Institute Committee or Advisory Committee to take or audit further courses to complement their background and research program. A list of approved electives is provided under 'Graduate Courses'.
4. Thesis Requirement - a research thesis on a topic in toxicology supervised by a faculty member of the Collaborative Program in Chemical and Environmental Toxicology.

Note: Item 2 above is not required for students who have already completed the Seminar in Toxicology for the master's specialization.

**Chemical and Environmental Toxicology Courses**

See departmental course lists for full descriptions.

Other courses listed in the calendar under the primary academic units of psychology, biology, or chemistry may be taken, with the approval of the student's supervisory committee, as options in addition to the basic requirements of the degree in chemical and environmental toxicology.

**Principles of Toxicology**

BIOL 6402 (BIO 9101) / CHEM 5708 (CHM 8156)

**Ecotoxicology**

BIOL 6403 (BIO 9104) / CHEM 5705 (CHM 9109)

**Seminar in Toxicology**

BIOL 6405 (BIO 9105) / CHEM 5805 (CHM 8167)

**Chemical Toxicology**

BIOL 5709 (BIO 8113) / CHEM 5709 (CHM 8157)



## Chemistry

Chemistry Department  
203 Steacie Building  
Tel.: 613-520-2600 x 3523  
carleton.ca/chemistry

- M.Sc. Chemistry
- M.Sc. Chemistry with Specialization in Chemical and Environmental Toxicology (Specialization requirements listed under Chemical and Environmental Toxicology)
- Ph.D. Chemistry
- Ph.D. Chemistry with Specialization in Chemical and Environmental Toxicology (Specialization requirements listed under Chemical and Environmental Toxicology)

### M.Sc. Chemistry

#### Admission Requirements

Honours B.Sc. degree in Chemistry, with a B+ average in the last two years and a B average overall.

Applicants who do not meet this requirement, or whose undergraduate degree is in another, closely related field, may be accepted into the program, but may be assigned extra courses.

#### Qualifying Year

Applicants who do not qualify for direct admission to the Master's program may be admitted to a qualifying-year program (see 2.3 under General Regulations).

5.0 credits must be completed within two consecutive fall and winter terms, including a 1.0 credit Research Project and Seminar course (CHEM 4908), and 4.0 credits in 0.5- and 0.25-credit courses, as assigned by the Graduate Supervisor. An average grade of A-over these five credits, with a minimum grade of B in each course must be presented to be considered for admission to the M.Sc. program.

#### Program Requirements

1. A research thesis defended at an oral examination (3.0 credits)
2. One credit of graduate courses (made up of any combination of 0.5 credit and 0.25 credit courses)
3. CHEM 5801 (1.0 credit)
4. Residence requirement - at least one year of full-time study

#### Guidelines for Completion of Master's Degree

Full-time students in the master's program will normally complete the degree requirements in two years. Part-time students will normally complete the degree requirements in four years.

#### Thesis Advisory Committee

Within four months of initial registration in the M.Sc. or Ph.D. program, a Thesis Advisory Committee (TAC) will be appointed for each student. Committee membership will be formally approved by the departmental chairs and OCCI directors at Carleton and the University of Ottawa. The committee will consist of a minimum of three members, including the thesis supervisor, and where practicable, at least one member will be from the other campus of OCCI. Committee membership may include adjunct faculty members of the Faculty of Graduate and Postdoctoral Studies (FGPS) at the University of Ottawa or the Faculty of Graduate Studies and Research at Carleton.

Once a year, the student will prepare a formal Thesis Progress Report. The report is not to exceed four pages and will outline the problem, methodology used, results achieved, and aims for future research.

The TAC will evaluate the report and indicate whether the student has made satisfactory progress. No meeting with the student will be required if progress is deemed by the TAC to be satisfactory. A meeting to discuss the student's progress may be held at any time at the request of either the student or the committee.

### Ph.D. Chemistry

#### About the Program

The Department of Chemistry offers a program of graduate studies and research leading to M. Sc. and Ph. D. degrees, in all areas of chemistry, including, analytical, inorganic, organic, physical and theoretical chemistry. Within these general areas, members of the faculty have active research programs in themes such as atomic layer deposition, bioinorganic sensors, functionally imprinted polymers, fungal toxicity, nanotechnology, polymers and nanocomposites, polymers for photonics, self assembly, thin films, microelectronics etc. Most of the instrument facilities relevant to these research activities exist in the department. We also leverage on the strength of the Ottawa Carleton Chemistry Institute for other instrumental needs. In addition to regular faculty members, several scientists from the government laboratories serve as adjunct professors with joint supervisory privileges. As needed, students are permitted to take courses from University of Ottawa towards the required credits. In addition to regular student funding, endowed scholarships are available to outstanding students.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission to the Ph.D. program is a B.Sc. or M.Sc. degree in Chemistry.

#### Program Requirements (from B.Sc.)

1. A research thesis defended before an examination board which includes an external examiner (11.0 credits)
2. A two-part comprehensive examination in chemistry. The first part consists of a research proposal examination. The proposal topic can be in the same research area as that of the student's thesis supervisor, but should be significantly different from the student's thesis research project and any research being conducted by any faculty member of the Ottawa-Carleton Chemistry Institute. The second part of the examination will consist of either a) a short presentation given by the student to an examining committee on a topic in his/ her research area, or b) a series of five two-hour examinations from a library of examinations. (No credit. Graded Pass or Fail.) Students admitted to the graduate program in Chemistry at Carleton University prior to May 1, 2003 may follow the Comprehensive Examination requirement published in the 2002-2003 Graduate Calendar. Students who fail to complete the comprehensive examination by the end of the third year in the graduate chemistry program will be withdrawn from the program.
3. Two credits of graduate courses (made up of any combination of 0.5 credit and 0.25 credit courses) 4. CHEM 5801 (1.0 credit) and CHEM 5802 (1.0 credit)
4. Residence requirement -at least three years of full-time study.
5. Full-time students who enter the doctoral program directly from the B.Sc. program normally will complete the degree requirements in four and

one-half years. Part-time students normally will complete the degree requirements in nine years.

#### **Program Requirements (from M.Sc.)**

- Same as above, except that only one seminar course will be required if a grade of at least A- has been obtained in Seminar I (CHEM 5801 or equivalent). In addition, credit for up to 1.0 credit of graduate courses may be given to reduce the requirement for graduate course credit from two to one, if a grade of at least an A- has been obtained in each of the courses taken during M.Sc. Students must complete their comprehensive examination within two years or be withdrawn from the program.
- Residence requirement - at least two years of full-time study.
- Full-time students in the doctoral program normally will complete the degree requirements in three years. Part-time students will normally complete the degree requirements in six years.

#### **Orientation Examinations**

Students coming from outside Canada or the United States must write orientation examinations at approximately the third-year university level. Each student will be informed of this requirement upon admission. The examinations will be given in the first week of the term in September and January. Students can choose from any three examination modules in: organic, physical, inorganic/analytical and biochemistry.

In examination areas where the student shows unsatisfactory performance or deficiency, the Graduate Supervisor will assign undergraduate-level remedial courses. To be eligible to continue in the graduate program, the student must achieve a minimum grade of A- in each remedial course.

#### **Thesis Advisory Committee**

Within four months of initial registration in the M.Sc. or Ph.D. program, a Thesis Advisory Committee (TAC) will be appointed for each student. Committee membership will be formally approved by the departmental chairs and OCCI directors at Carleton and the University of Ottawa. The committee will consist of a minimum of three members, including the thesis supervisor, and where practicable, at least one member will be from the other campus of OCCI. Committee membership may include adjunct faculty members of the Faculty of Graduate and Postdoctoral Studies (FGPS) at the University of Ottawa or the Faculty of Graduate Studies and Research at Carleton.

Once a year, the student will prepare a formal Thesis Progress Report. The report is not to exceed four pages and will outline the problem, methodology used, results achieved, and aims for future research. The TAC will evaluate the report and indicate whether the student has made satisfactory progress. No meeting with the student will be required if progress is deemed by the TAC to be satisfactory. A meeting to discuss the student's progress may be held at any time at the request of either the student or the committee.

## Civil Engineering

Ottawa Carleton Institute of Civil Engineering  
 Carleton University  
 Minto 3090  
 Phone: 613-520-5659  
 Fax: 613-520-3899  
 www.ocice.ca

- M.A.Sc. Civil Engineering
- M.Eng. Civil Engineering
- Ph.D. Civil Engineering

### M.A.Sc., M.Eng. Civil Engineering

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission to a master's program is a bachelor's degree with at least high honours standing in civil engineering.

1. Graduates from engineering programs other than civil engineering, or Honours science programs with a mathematics content equivalent to the civil engineering program will have to take a minimum of four qualifying undergraduate civil engineering courses in their area of graduate specialty.
2. Graduates from other science programs will have to take all the core engineering undergraduate mathematics courses in addition to the requirements specified in (1) above.

The undergraduate courses required will be specified in the Certificate of Admission.

Undergraduate civil engineering courses will not be accepted towards a graduate degree. Graduate students may still be required to take undergraduate courses for credit to fulfil the admission requirements.

No more than one half of the program credit requirements or that stipulated in the regulations of the university in which the student is registered, whichever is less, can be transferred at admission. At least one half of the course work must be taken at the Institute.

#### Program Requirements

Study at the master's level can be pursued through either a thesis leading to a M.A.Sc., a project option leading to a M.Eng., or a course work option leading to a M.Eng.

Requirements are stated in terms of Carleton University credits.

#### Master's degree by thesis (M.A.Sc.):

- 3.0 course credits
- Thesis equivalent to 3.0 course credits
- Participation in the graduate student seminar series (CIVE 5901)(0.0 credit)
- Successful oral defence of the thesis

#### Master's degree by project (M.Eng.):

- 4.0 course credits
- A project equivalent to 1.0 course credits

#### Master's degree by course work (M.Eng.):

- 5.0 course credits

## Ph.D. Civil Engineering

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission into the Ph.D. program is a master's degree with thesis in civil engineering. Students who have been admitted to a master's program may be permitted to transfer into the Ph.D. program if they show outstanding academic performance and demonstrate significant promise for advanced research.

#### Program Requirements

Requirements are stated in terms of Carleton University credits.

- A minimum of 2.0 course credits
- Participation in the graduate student seminar series (CIVE 6901) 0.0 credit
- Successful completion of written and oral comprehensive examinations in subject areas determined by the student's advisory committee
- Successful completion of a thesis proposal examination
- Thesis (8.0 credits)
- Successful oral defence of the thesis. The examination board for all theses will include an external examiner, and, when possible, professors from both departments.
- Subject to approval of his/her advisory committee, a Ph.D. student may take, or be required to take, courses in other disciplines.
- Students who have been permitted to transfer into the Ph.D. program from a master's program without having completed the master's degree will require 5.0 course credits for the Ph.D. degree which include transfer of credits from the incomplete master's program.

#### Graduate Courses

In all programs, the student may choose graduate courses from either university with the approval of the adviser or the advisory committee. Graduate courses are listed below, grouped by subject area. Course descriptions may be found in the departmental section of the calendar concerned. All courses are of one term duration. The codes given in parentheses are those used by the University of Ottawa. Courses beginning with "CIVE" and "ENVE" are offered at Carleton University and those beginning with "CIVJ" and "ENVJ" are offered at the University of Ottawa. Not all courses listed are necessarily given during one academic year.

#### Geotechnical and Soils

CIVE 5209 (CVG 7100)	Geotechnical Case Studies
CIVE 5300 (CVG 7101)	Advanced Soil Mechanics
CIVE 5500 (CVG 7104)	Earth Retaining Structures
CIVE 5501 (CVG 7105)	Foundation Engineering
CIVE 5502 (CVG 7106)	In-situ Geotechnique
CIVE 5503 (CVG 7107)	Num. Methods in Geomechanics
CIVE 5504 (CVG 7108)	Seepage through Soils
CIVE 5505 (CVG 7109)	Geotechnical Earthquake Engineering
CIVE 5800 - CIVE 5804 (CVG 7305 - CVG 7309)	Topics in Geotechnique
(CVG 5100) CIVJ 5000	Deep Foundations
(CVG 5103) CIVJ 5003	Dam Engineering
(CVG 5106) CIVJ 5006	Site Improvements
(CVG 5108) CIVJ 5008	Pile Dynamics
(CVG 5161) CIVJ 5106	Mechanics of Unsaturated Soils

(CVG 5171) CIVJ 5102	Strength and Deformation Behaviour of Soil and Rock	(CVG 5122) CIVJ 5508	Groundwater and Seepage
(CVG 5174) CIVJ 5104	Soil Plasticity	(CVG 5123) CIVJ 5509	Advanced Topics in Hydrology
(CVG 5175) CIVJ 5105	Numerical Methods for Geotechnical Engineers	(CVG 5124) CIVJ 5605	Coastal Engineering
(CVG 5177) CIVJ 5107	Offshore Geotechnique	(CVG 5125) CIVJ 5601	Statistical Methods in Hydrology
(CVG 5178) CIVJ 5108	Ice Mechanics	(CVG 5126) CIVJ 5602	Stochastic Hydrology
<b>Structural Engineering</b>		(CVG 5127) CIVJ 5603	Hydrologic Systems Analysis
CIVE 5101 (CVG 7120)	Introductory Elasticity	(CVG 5128) CIVJ 5604	Water Resources Planning and Policy
CIVE 5102 (CVG 7121)	Advanced Elasticity	(CVG 5131) CIVJ 5606	River Engineering
CIVE 5103 (CVG 7122)	Finite Element Analysis 1	(CVG 5140) CIVJ 5607	Irrigation and Drainage
CIVE 5104 (CVG 7123)	Earthquake Engineering Analysis	(CVG 5160) CIVJ 5503	Sediment Transport
CIVE 5105 (CVG 7124)	Finite Element Analysis 2	(CVG 5162) CIVJ 5504	River Hydraulics
CIVE 5106 (CVG 7137)	Dynamics of Structures	<b>Environmental</b>	
CIVE 5200 (CVG 7138)	Masonry Behaviour and Design	ENVE 5001 (CVG 7160)	Biofilm Processes
CIVE 5203 (CVG 7125)	Theory of Structural Stability	ENVE 5101 (EVG 7101)	Air Pollution Control
CIVE 5204 (CVG 7126)	Advanced Steel Structures	ENVE 5102 (CVG 7161)	Traffic-Related Air Pollution
CIVE 5205 (CVG 7127)	Advanced Structural Analysis	ENVE 5103 (CVG 7162)	Air Quality Modeling
CIVE 5206 (CVG 7128)	Prestressed Concrete	ENVE 5104 (EVG 7104)	Indoor Air Quality
CIVE 5208 (CVG 7130)	Advanced Reinforced Concrete	ENVE 5201 (EVG 7201)	Geo-Environmental Engineering
CIVE 5600 (CVG 7131)	Project Management	ENVE 5202 (EVG 7202)	Contaminant Fate Mechanisms
CIVE 5601 (CVG 7140)	Eng. Stats. and Probabilities	ENVE 5203 (CVG 7164)	Hazardous & Radioactive Wastes
CIVE 5602 (CVG 7141)	Advanced Computer-Aided Design	ENVE 5301 (EVG 7301)	Contaminant Hydrogeology
CIVE 5605 (CVG 7143)	Design of Steel Bridges	ENVE 5302 (CVG 7163)	Case Studies in Hydrogeology
CIVE 5606 (CVG 7144)	Design of Concrete Bridges	ENVE 5303 (EVG 7303)	Multiphase Flow in Soils
CIVE 5607 (CVG 7145)	Introduction to Bridge Design	ENVE 5401 (EVG 7401)	Env. Impacts of Major Projects
CIVE 5609 (CVG 7170)	Fundamentals of Fire Safety Engineering	ENVE 5402 (EVG 7402)	Finite Elements in Field Problems
CIVE 5610 (CVG 7171)	Fire Dynamics I	(CVG 5130) ENVJ 5900	Wastewater Treatment Process Design
CIVE 5611 (CVG 7173)	People in Fires	(CVG 5132) ENVJ 5901	Unit Operations of Water Treatment
CIVE 5612 (CVG 7174)	Fire Modeling	(CVG 5133) ENVJ 5906	Solid Waste Disposal
CIVE 5613 (CVG 7172)	Fire Dynamics II	(CVG 5134) ENVJ 5907	Chemistry for Environmental Engineering
CIVE 5614 (CVG 7175)	Design for Fire Resistance	(CVG 5137) ENVJ 5905	Water and Wastewater Treatment Process Analysis
CIVE 5705 - CIVE 5709 (CVG 7300-7304)	Topics in Structures	(CVG 5139) ENVJ 5700	Environmental Assessment of Civil Engineering Projects
(CVG 5142) CIVJ 5201	Advanced Structural Dynamics	(CVG 5138) ENVJ 5902	Advanced Water Treatment
(CVG 5143) CIVJ 5202	Advanced Structural Steel Design	(CVG 5179) ENVJ 5908	Anaerobic Digestion
(CVG 5144) CIVJ 5300	Advanced Reinforced Concrete Design	(CVG 5180) ENVJ 5909	Biological Nutrient Removal
(CVG 5145) CIVJ 5203	Theory of Elasticity	(CVG 5232) ENVJ 5911	Unit Operation of Water Treatment Lab [0.25 Credit]
(CVG 5146) CIVJ 5302	Numerical Methods of Structural Analysis	(CVG 5238) ENVJ 5912	Advanced Water Treatment Processes Lab [0.25 credit]
(CVG 5147) CIVJ 5204	Theory of Plates and Shells	(CVG 5331) ENVJ 5902	Sludge Utilization and Disposal
(CVG 5148) CIVJ 5305	Prestressed Concrete Design	<b>Directed Studies and Seminars</b>	
(CVG 5149) CIVJ 5304	Structural Stability	CIVE 5901	Master's Seminar
(CVG 5150) CIVJ 5206	Advanced Concrete Technology	CIVE 5906 (CVG 6108)	Directed Studies 1
(CVG 5153) CIVJ 5209	Wind Engineering	CIVE 5907 (CVG 6109)	Directed Studies 2
(CVG 5155) CIVJ 5306	Earthquake Engineering	CIVJ 6000 - CIVJ 6020 (CVG 6300 - CVG 6320)	Special Topics
(CVG 5156) CIVJ 5301	Finite Element Methods I	CIVE 6901	Ph.D. Seminar
(CVG 5157) CIVJ 5303	Finite Element Methods II	ENVE 5701-ENVE 5705	Topics in Environmental Engineering
(CVG 5158) CIVJ 5307	Elements of Bridge Engineering	(EVG 7301- EVG 7305)	
(CVG 5154) CIVJ 5308	Random Vibrations	<b>Projects and Theses</b>	
(CVG 5159) CIVJ 5309	Long Span Structures	CIVE 5900	Civil Engineering Project
<b>Transportation</b>		CIVE 5909	M.A.Sc. Thesis
CIVE 5303 (CVG 7103)	Pavements and Materials	CIVE 6909	Ph.D. Thesis
CIVE 5304 (CVG 7150)	Intercity Transportation	(CVG 6000)	Civil Engineering Report
CIVE 5305 (CVG 7151)	Traffic Engineering	(CVG 7999)	M.A.Sc. Thesis
CIVE 5306 (CVG 7152)	Highway Materials	(CVG 9998)	Comprehensive Exam (Ph.D.)
CIVE 5307 (CVG 7153)	Urban Transportation	(CVG 9999)	Ph.D. Thesis
CIVE 5308 (CVG 7154)	Highway Geometric Design		
CIVE 5309 (CVG 7155)	Transportation Supply		
CIVE 5401 (CVG 7156)	Transportation Economics		
CIVE 5402 (CVG 7159)	Transportation Terminals		
CIVE 5403 (CVG 7158)	Airport Planning		
CIVE 5805 - CIVE 5809 (CVG 7310 - 7314)	Topics in Transportation		
<b>Water Resources</b>			
(CVG 5111) CIVJ 5501	Hydraulic Structures		
(CVG 5112) CIVJ 5502	Numerical Modeling in Water Resources		
(CVG 5119) CIVJ 5803	Computational Hydraulics		
(CVG 5120) CIVJ 5506	Water Resources Systems		



## Cognitive Science

Institute of Cognitive Science  
Dunton Tower 2201  
Tel.: 613-520-2368

- M. Cognitive Science
- Ph.D. Cognitive Science

### M.Cognitive Science

#### About the Program

Cognitive Science is an interdisciplinary approach to the study of human and artificial cognition. It integrates research from experimental psychology, theoretical and computational linguistics, artificial intelligence, philosophy of mind, and other related areas to address questions about learning, knowing, and thinking. The researchers who are involved in Carleton's programs in Cognitive Science have strengths in areas such as consciousness, cognitive development, mathematical cognition, cognitive and computational modelling, human performance, applied cognition, syntax, semantics, pragmatics, philosophy of mind and language, symbolic and computational logic, intelligent information systems, knowledge representation, natural language understanding, swarm and collective intelligence, evolutionary computing, and some areas of neuroscience. The program also involves researchers from industry, government agencies, and other post-secondary institutions.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The requirement for admission into the M.Cog.Sc. program is an Honours degree with an average of at least A-.

Applicants whose first language is not English must demonstrate a fluent knowledge of English. This is normally done in one of the following ways:

1. An overall score of 70 on the Canadian Academic English Language (CAEL) Assessment
2. A TOEFL score of 230 CBT (computer-based test) or 580; or 86 IBT overall with a minimum score in each component of writing (22), speaking (22), reading (20) and listening (20).
3. An overall IELTS score of 6.5, with a minimum of 6.0 in each band score; or
4. An acceptable certification that the language of instruction in your most recently completed undergraduate or graduate degree was English.

To be admitted, a candidate must submit a description of his or her research interests in the area of Cognitive Science.

#### Program Requirements

There are two options for the M.Cog.Sc. program – Research Project or Thesis.

##### M.Cog.Sc. (Research Project Option) requirements:

1. 0.5 credit in CGSC 5100 Issues in Cognitive Science
2. 0.5 credit in CGSC 5101 or CGSC 5102 Methods course
3. 1.5 credits from the following course selection: CGSC 5001, CGSC 5002, CGSC 5003, CGSC 5004 and CGSC 5005
4. 1.0 credit in CGSC 5908 Research Project

5. 1.5 credits in cognitive science or other approved courses selected in consultation with the graduate supervisor.
6. Preparation of research for presentation at the Cognitive Science Spring Conference (see above).

##### M.Cog.Sc. program (Thesis Option) requirements:

1. 0.5 credit in CGSC 5100 Issues in Cognitive Science
2. 0.5 credit from CGSC 5101 or CGSC 5102 Methods course
3. 1.5 credits in cognitive science or other approved courses selected in consultation with the graduate supervisor.
4. 2.5 credits in CGSC 5909 M.Cog.Sc. Thesis
5. Preparation of research for presentation at the Carleton Cognitive Science Graduate Conference (see above).

##### Guidelines for Completion of the M.Cog.Sc. Degree

The degree is expected to take no more than four (4) terms to complete. Students will enroll in courses while also conducting research. While all students will take some core courses, the specific balance of the remaining credits (coursework and research) will vary by student. Credit selection will be determined in consultation with either the Graduate Supervisor or the student's faculty advisor.

### Ph.D. Cognitive Science

#### About the Program

Cognitive Science is an interdisciplinary approach to the study of human and artificial cognition. It integrates research from experimental psychology, theoretical and computational linguistics, artificial intelligence, philosophy of mind, and other related areas to address questions about learning, knowing, and thinking. The researchers who are involved in Carleton's programs in Cognitive Science have strengths in areas such as consciousness, cognitive development, mathematical cognition, cognitive and computational modelling, human performance, applied cognition, syntax, semantics, pragmatics, philosophy of mind and language, symbolic and computational logic, intelligent information systems, knowledge representation, natural language understanding, swarm and collective intelligence, evolutionary computing, and some areas of neuroscience. The program also involves researchers from industry, government agencies, and other post-secondary institutions.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

- Master's degree (or the equivalent) from one of the participating disciplines. An average of at least A- in courses in cognition is normally required.
- Applicants with a master's degree in one of the participating disciplines are normally admitted to a 10.0-credit program.
- Students eligible for admission to the 10.0 -credit program but with deficiencies may be required to take additional courses or may be directed to apply for the M. Cog.Sc.
- An overall score of 70 on the Canadian Academic English Language (CAEL) Assessment
- A TOEFL score of 230 CBT (computer-based test) or 580; or 86 IBT overall with a minimum score in each component of writing (22), speaking (22), reading (20) and listening (20).



- An overall IELTS score of 6.5, with a minimum of 6.0 in each band score; or
- An acceptable certification that the language of instruction in your most recently completed undergraduate or graduate degree was English.
- To be admitted, a candidate must submit a description of his or her proposed area of thesis research and a member of the core faculty must indicate in writing that he or she is willing to supervise the student.

### Program Requirements

The requirements of the Ph.D. in Cognitive Science are:

- 0.5 credit in CGSC 6001 Theory and Methods of Cognitive Science
- 1.0 credit in CGSC 6800 Proseminar
- 0.5 credit in CGSC 6002 Methodology Rotation I
- 0.5 credit in CGSC 6003 Methodology Rotation II
- 5.0 credits in CGSC 6909 Prospectus and Thesis. The prospectus must be defended at an oral comprehensive examination on the subject-matter of the thesis. The thesis must also be defended at an oral examination.
- 2.5 credits in cognition from three different cognitive disciplines, including at least 0.5 credit in neuroscience if not already completed.
- Preparation in first year of a research paper for presentation at the Cognitive Science Spring Conference (see below). Usually prepared as an assignment for one of a student's graduate courses in cognition.
- Preparation in second year of a research paper for presentation at the Cognitive Science Spring Conference (see below). Usually prepared as an assignment for one of a student's graduate courses in cognition.
- Program to be selected in consultation with the Graduate Supervisor of Cognitive Science.
- Any student planning a dissertation with an applied cognitive emphasis is required to work for at least one term at a facility approved by the student's research supervisor and the Director of the Cognitive Science Program. Such a facility may include any institution, governmental laboratory, corporation, hospital or educational centre conducting research in the area of the student's specialization. Students should complete this work while registered in either the Methodology Rotation (CGSC 6905, CGSC 6002, CGSC 6003) or the Ph.D. Thesis (CGSC 6909).

### Methodology Rotation

The methodology rotation consists of two parts. Students spend one term in each of two laboratories or other research venues using two different methods for studying cognition (behavioural, linguistic-theoretic, computational, conceptual, neuroscientific).

The purpose of the methodology rotation is to give students sufficient background in two different approaches to cognition to allow the student to use work from these approaches in his or her own research.

Assignments will be as specified by each rotation supervisor. Each rotation will be graded separately by the supervisor, Passed with Distinction (PWD)/Satisfactory(S)/Unsatisfactory (U). In the event of a grade of U the student may repeat a rotation only once.

### Prospectus, Comprehensive Examination, Thesis and Defense

When a student is ready to begin work on a thesis (dissertation), the Graduate Supervisor approves a dissertation committee which must have at least three members from two different approaches to cognition, including the advisor or co-advisors plus the Director of the Cognitive Science doctoral program ex officio. Preparation of the thesis has two stages. First the student prepares a prospectus, which is examined at a comprehensive examination on the subject matter of the thesis. Then the student prepares the thesis, which is defended at a public oral examination. Specifically:

#### Prospectus

The prospectus must describe the proposed research and review the relevant literature in the field of the research. The research proposal must be sufficiently detailed to allow the examining committee to judge the likelihood of a successful dissertation ensuing from it. Preparation of the prospectus will follow the practices common in the advisor's area of research. The committee may add further requirements.

#### Comprehensive Examination

The prospectus is examined orally by a board consisting of the members of the dissertation committee. The committee may add further examiners. The examination is a comprehensive examination of the thesis subject matter, to ensure that the student has a sound understanding of the context of his or her proposed research, and of appropriate methods, ethical considerations, and so on. The examining board will also consider the research that the student is proposing, which must be of sufficiently high quality and described in sufficient detail to allow the committee to judge whether, if completed successfully, it would be likely that the student would be awarded the degree. Should a student fail the comprehensive exam or his or her prospectus is unacceptable, the student may resubmit the prospectus and be reexamined once.

#### Thesis

The completed thesis is examined orally by an examining board consisting at minimum of the dissertation committee, an examiner at arm's length to the project from within Carleton (the 'internal external') and an examiner from another university who is at arm's length to the student and the committee and who is a recognized expert in the area of the dissertation. All university regulations apply.

#### Residence Requirement

All Ph.D. candidates must be registered full-time in a minimum of six terms to satisfy the residence requirement.

#### Language Requirement

A second language is required when relevant to the student's program of research. Whether a second language is required and the level of proficiency expected is determined at the time of admission, based on the student's description of his or her proposed area of thesis research.

#### Milestones for Completion of the Ph.D. Degree

To assist all Ph.D. students to progress through their program in a timely manner, the Ph.D. Cognitive Science Program has milestones in place to mark students' progress. In the first year, the students are expected to complete CGSC 6800 (Proseminar in Cognitive Science) and make substantial progress in their coursework. Students are expected to complete CGSC 6001 (Theory and Methods) in their first two years (it is offered in alternate years). During second year, students are expected to complete their coursework and to begin their two methodology rotations (CGSC 6002 and CGSC 6003). The methodology rotations

## Programs - Cognitive Science

must be completed by the beginning of the third year. The research requirements in first and second year apply to all students. The third year is devoted to research and preparing your Prospectus and defending it (this is the Comprehensive requirement). The prospectus is to be defended by the end of third year. The fourth year and, if necessary fifth year, are to be spent completing your research, completing the dissertation, and defending it.

### **First year**

Proseminar, Theory and Methods (if available), coursework, presentation at Spring Conference

### **Second year**

Theory and Methods (if available), coursework and methodology rotations, presentation at Spring Conference

### **Third year**

Prospectus and comprehensive exam, presentation at Spring Conference

### **Fourth-fifth year**

Thesis and thesis defence

## Communication

School of Journalism and Communication  
St. Patrick's Bldg. 344A  
Tel.: 613-520-7408  
carleton.ca/communication

- M.A. Communication
- Ph.D. Communication

### M.A. Communication

#### About the Program

The Communication program of the School of Journalism and Communication offers a program of studies leading to a Master of Arts degree in Communication. Courses covering four areas of concentration are offered:

- the history of communication and media systems
- communication/information technologies and society
- communication and social relations
- communication policy and political economy

Additional information may be obtained by consulting the supervisor of graduate studies.

#### Academic Regulations

See the General Regulations section of this Calendar.

A standing of B- or better must be obtained in each credit counted towards the master's degree.

#### Admission Requirements

The minimum requirement for admission to the master's program is a B.A.(Honours) degree or the equivalent, with high honours standing in communication or a related discipline. Related disciplines may include sociology, political science, film studies, and Canadian studies.

Applicants without a background in communication studies may be required to take certain designated courses from the undergraduate Communication program in addition to their regular program.

Possession of the minimum entrance standing is not in itself, however, assurance of admission into the program.

Applicants who lack an Honours degree but who have a 3-year degree with honours standing (a minimum B standing overall) may be considered for admission to a qualifying-year program. Students who complete the qualifying year with high honours standing may be considered for admission to the master's program in the following year. Refer to the General Regulations section of this Calendar for regulations governing the qualifying year.

#### Program Requirements

Each student, in consultation with the supervisor of graduate studies, will be required to follow a thesis, non-thesis, or a course-only program for a total of 5.0 credits. Two of the four areas of concentration must be chosen.

In selecting their program of studies, all students will be required to take COMM 5101 and COMM 5605. Students in the M.A. program are restricted to one directed studies course, COMM 5808 (0.5 credit). Students may take one optional course (0.5

credit) outside the program, with permission of the supervisor of graduate studies.

All master's students are required to complete:

- 1.0 credit in COMM 5101
- 0.5 credit in COMM 5605
- 2.0 credits in Thesis
- 1.5 credits from the list of optional courses below, or a research essay (1.0 credit) and 2.5 credits chosen from the list of optional courses, or 3.5 credits chosen from the list of optional courses

#### Optional Courses

COMM 5200, COMM 5202, COMM 5203, COMM 5204, COMM 5206, COMM 5208, COMM 5210, COMM 5212, COMM 5214, COMM 5216, COMM 5218, COMM 5509, COMM 5808

Note: students may take up to 0.5 credit outside the program with permission of the supervisor of graduate studies.

### Ph.D. Communication

#### About the Program

The School of Journalism and Communication offers a program of studies leading to the Doctor of Philosophy degree in Communication. The program focuses on three fields of concentration:

- The history of communication
- The political economy of communication
- The socio-cultural analysis of communication

#### Academic Regulations

See the General Regulations section of this Calendar.

A standing of B- or better must be obtained in each course counted towards the Ph.D. degree.

#### Admission Requirements

The normal requirement for admission into the doctoral program is a master's degree (or the equivalent) in communication or a cognate field such as journalism studies, with an overall average of B+ or better.

Applicants who have deficiencies in certain areas may be admitted to the Ph.D. Program, but will normally be required to complete additional course work.

#### Program Requirements

Doctoral candidates must successfully complete the equivalent of 10.0 credits. The specific requirements are as follows:

- 1.0 credit in COMM 6000
- 2.0 additional credits from the list of optional courses below; up to 0.5 credit may be taken in a relevant discipline outside of the School; students in the Ph.D. program are restricted to one (0.5 credit) directed studies course (COMM 6010)
- 2.0 credits in Comprehensive examinations
- 5.0 credits in a Thesis (5.0 credits) which must be defended at an oral examination
- A language requirement as stated below

#### Optional Courses

All doctoral candidates must complete 2.0 additional credits from the list of optional courses below; 0.5 credit may be taken in a relevant discipline outside

of the School, particularly those that address central theoretical and/or methodological issues within the student's chosen field of concentration. Students in the Ph.D. program are restricted to one (0.5 credit) directed studies course (COMM 6010).

COMM 5200, COMM 5202, COMM 5203,  
COMM 5204, COMM 5206, COMM 5208,  
COMM 5210, COMM 5212, COMM 5214,  
COMM 5216, COMM 5218, COMM 5509,  
COMM 5605, COMM 6001, COMM 6005,  
COMM 6006, COMM 6007, COMM 6010,  
JOUR 5401, JOUR 5500

#### **Comprehensive Examinations**

In addition to their course requirements, doctoral candidates are required to write two comprehensive examinations each worth 1.0 credit. The first comprehensive examination (COMM 6900) is closely related to the course materials in the doctoral seminar (COMM 6000) and is conducted by the instructors of COMM 6000 in May following completion of the seminar. To be eligible for the first comprehensive, candidates must have a GPA of 9.0 or higher on their previous course work, including COMM 6000. Students who fail the first comprehensive may be asked to withdraw from the program.

The second comprehensive examination (COMM 6901) is normally completed during the second year of the program and tests the student's in-depth knowledge of one field of study. It is conducted by the student's supervisor and advisory committee and involves examination of an approved project related to the chosen field. Before taking the second comprehensive examination, students must have completed all of their course work with a GPA of 9.0 or higher and have satisfactorily completed COMM 6900. The second comprehensive is expected to be completed no later than two years or six terms after initial full-time registration, or four years or 12 terms after initial part-time registration. Students who do not fulfil this requirement within the prescribed time period may be asked to withdraw from the program.

#### **Language Requirement**

Students are required to demonstrate an understanding of a language other than English, preferably French. Language testing will be administered by the School and will normally include a demonstration of reasonable understanding, on sight, of material contained in selected samples of scholarly literature in a foreign language and in the field of communication.

#### **Thesis Requirement**

A thesis proposal is presented after the comprehensive requirement has been satisfied, and defended at an oral presentation. The thesis, normally equivalent to 5.0 credits, must be successfully defended at an oral examination.

# Computer Science

School of Computer Science  
Herzberg Bldg 5302  
Tel.: 613-520-4333  
scs.carleton.ca

- M.C.S. Computer Science
- M.C.S. Computer Science with Specialization in Bioinformatics (Specialization requirements listed under Bioinformatics)
- M.Sc. Information and Systems Science (Computer Science) (listed under Information and Systems Science)
- Ph.D. Computer Science

## M.C.S. Computer Science

### About the Program

The M.C.S. program leads to a graduate degree in Computer Science. The program combines breadth knowledge in computer science through course work and depth knowledge in the area of specialization through research (M.C.S. Thesis option) or through course work and a project (M.C.S. non-Thesis option).

- Software Engineering
- Theory of Computing
- Computer Systems

Within these areas, the program emphasizes problems of current practical significance and advances in computer science knowledge. The program fosters collaborative and interdisciplinary work with the scientific and industrial (private and public) communities.

### Academic Regulations

See the General Regulations section of this Calendar.

### Admission Requirements

Applicants should have an Honours bachelor's degree in computer science or the equivalent, with at least high honours standing. By equivalent is meant an Honours degree in a program that includes at least twelve computer science half-credits, two of which must be at the 4000-level, and eight half-credits in mathematics, one of which must be at the 3000- or 4000-level. These courses must include the topics indicated below:

#### Computer Science

Data structures/file management, operating systems, computer architecture, algorithm design and analysis, assembly language and two high-level languages

#### Mathematics

Calculus, linear algebra, algebraic structures or discrete mathematics, probability and statistics, numerical analysis.

Applicants who have a general (3-year) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program. Refer to the General Regulations section of this Calendar for regulations governing the qualifying year.

### Program Requirements

Normally, students in the program will be expected to complete a thesis; however, students who have substantial relevant work experience may be permitted to take the non-thesis option, which must include a graduate research project course.

Each candidate submitting a thesis will be required to undertake an oral defence of the thesis.

### Thesis Option Requirements

- 2.5 credits in course work
- Fulfilment of the graduate seminar requirement
- 2.5 credits Thesis.

### Non-Thesis Option Requirements

- 4.0 credits in course work
- Fulfilment of the graduate seminar requirement
- 1.0 credit in graduate project (a project may be completed in one or two terms)

### Notes:

1. Course selections must be approved by the student's academic adviser, and must include at least (see OCICS course listing):
  - 0.5 credit in software engineering
  - 0.5 credit in the theory of computing
  - 0.5 credit in either computer applications or computer systems
2. The graduate seminar requirement includes a seminar presentation and participation in at least ten sessions in the joint graduate student seminar series.
3. Both course and thesis work may be completed either by full-time or part-time study.
4. A candidate may be permitted to carry out thesis work off campus provided suitable arrangements are made for supervision and experimental work, and prior approval is given by the Institute.

### Co-operative Option

A co-operative option is also available to full-time students in the Masters of Computer Science. Co-operative education is based on the principle that academic studies combined with work experience are desirable for effective professional preparation.

In addition to all other requirements for the degree, students admitted to the co-operative option must satisfactorily complete two work terms placements with a suitable employer in order to graduate with a co-op designation on their transcripts and diplomas. It is desirable that the work placements be related to the student's research. Placements are subject to the approval of the Supervisor of Graduate Studies and of the student's research supervisor. These work terms are four months in duration and students will conduct job searches through the university's co-op office. During a work term, students will register in one of the co-op work term courses: COMP 5906 (CSI 6901) or COMP 5907 (CSI 6902). While on a work term, students in this option are limited to taking one additional 0.5-credit course, or registering in their thesis.

Students in the co-op option normally apply for admission to the co-operative option during their first academic term. This option requires an initial study period of two academic terms, typically followed by two work terms and a final academic period to complete the remaining requirements of the degree. The student must submit a work term report or make a formal oral presentation upon the completion of each work placement, and receive a grade of Satisfactory in order to meet the requirements for the successful completion of that work term's requirement.

### Guidelines for Completion of Master's Degree

The following completion times are estimates only, based on full-time study, and are intended to provide guidance only.

Students are urged to check with the supervisor of graduate studies to determine the exact requirements of the degree program and other related information.



Part-time students should calculate the completion times requirement by doubling the time estimates given below.

Students should complete the course work within the first two terms.

Selection of courses should be done in consultation with the student's faculty advisor. Approval from the Graduate Supervisor of the Institute is only required for courses not listed as valid OCIGS courses. Subject to the approval of the Graduate Supervisor, M.C.S. students may take courses in other relevant disciplines. At least half of the course credits of an M.C.S. student must be valid OCIGS courses. At most, two Fourth Year undergraduate courses may be taken with the permission of the Graduate Supervisor. A thesis supervisor and thesis topic must be selected by the end of the second term. The supervisor of graduate studies should be formally notified of this selection. The expected completion time for the M.C.S. degree is four to six terms of full-time study depending on the type of thesis and the area of research.

Students wishing to pursue the co-op option normally apply for admission to the co-operative option during their first academic term. This option requires an initial study period of two academic terms, typically followed by two work terms and a final academic period to complete the remaining requirements of the degree. The student must submit a work term report or make a formal oral presentation upon the completion of each work placement, and receive a grade of Satisfactory in order to meet the requirements for the successful completion of that work term's requirement.

## Ph.D. Computer Science

### About the Program

The Ph.D. program leads to a Doctor of Philosophy degree in Computer Science. The program combines breadth knowledge in computer science through course work and depth knowledge in the area of specialization through research (Ph.D. Thesis option).

### The Ph.D. areas of specialization are:

- Software Engineering
- Theory of Computing
- Computer Applications
- Computer Systems

Within these areas, the program emphasizes problems of current practical significance and advances in computer science knowledge. The program fosters collaborative and interdisciplinary work with the scientific and industrial (private and public) communities.

### Academic Regulations

See the General Regulations section of this Calendar.

### Admission Requirements

Admission to the Ph.D. in Computer Science requires a Masters in Computer Science with thesis, or equivalent including demonstrated significant research ability.

In exceptional cases, students who are currently in the M.C.S. program and who have completed all course requirements with a grade of no less than A in each course may be permitted to transfer into the Ph.D. program.

### Program Requirements

- A minimum of 1.5 credits at the graduate level in at least three different research areas (see OCIGS course grouping by area).

- The admission committee and the student's advisory committee may impose additional program requirements according to the student's background and research topic.
- The thesis weight will be of 8.5 credits.
- Presentation of at least two seminars in the Ottawa-Carleton Institute for Computer Science seminar series: Minimally, the student must make one presentation for the graduate seminar, and one presentation for the departmental seminar.
- A comprehensive examination (COMP 6907) involving breadth and depth components.
- A written thesis proposal (COMP 6908) defended at an oral examination.
- A research thesis (COMP 6909) defended at an oral examination.

### Guidelines for Completion of Doctoral Degree

The following completion times are estimates based on full-time study.

- During the first term, the student and his or her faculty adviser should select graduate courses related to their area(s) of research and interests. Approval from the Graduate Supervisor of the Institute is only required for courses not listed as valid OCIGS courses.
- Subject to the approval of the Graduate Supervisor, Ph.D. students may take courses in other relevant disciplines. At least half of the course credits of a Ph.D. student must be valid OCIGS courses.
- An advisory committee comprised of three to five faculty members must be established before the student registers in the comprehensive examination. The committee is responsible for the comprehensive examination, the thesis proposal, and for guiding the student's research. The advisory committee must include at least one representative from SITE. The advisory committee must be approved by the director or associate director of the Institute.
- Comprehensive examinations (see COMP 6907) must be taken within the first 4 terms.
- All course requirements must be completed within the first 6 terms.
- Within the first 8 terms, the student must submit a written thesis proposal and defend it in an oral examination (see COMP 6908).
- The expected completion time for the Ph.D. program is approximately twelve terms depending on the type of thesis and the area of research.
- Before the completion of the program, the student is expected to present at least two seminars in the Ottawa-Carleton Institute for Computer Science seminar series.

### Residence Requirement

Students must fulfil a residence requirement of at least four terms of full-time study.

### Graduate Courses

Not all of the following courses are offered in a given year. For an up-to-date statement of course offerings or to determine the term of offering, consult central.carleton.ca

Subject to the approval of the Graduate Supervisor, M.C.S. and Ph.D. students may take courses in other relevant disciplines. The courses in the following list are offered by the two departments forming OCIGS.

**Carleton University**  
COMP School of Computer Science

**University of Ottawa**  
CSI School of Information Technology and Engineering

**Software Engineering**

COMP 5001 (CSI 5113)  
COMP 5104 (CSI 5314)  
COMP 5106 (CSI 5123)  
COMP 5400 (CSI 5310)  
COMP 6104 (CSI 7314)  
COMP 6603 (CSI 7161, CSI 7561)

CSI 5107 (COMP 5609) Program Construction and Fault Tolerance  
CSI 5109 (COMP 5701) Specification Methods for Distributed Systems  
CSI 5111 (COMP 5501) Software Quality Engineering  
CSI 5112 (COMP 5207) Software Engineering  
CSI 5115 (COMP 5503) Database Analysis and Design  
CSI 5118 (COMP 5302) Automated Verification and Validation of Software  
CSI 5122 (COMP 5301) Software Usability  
CSI 5134 (COMP 5004) Fault Tolerance  
CSI 5143 (COMP 5403) Real-time Systems Development  
CSI 5184 (COMP 5804) Logic Programming  
CSI 5507 (COMP 5609) Les programmes : construction et tolérance aux fautes  
CSI 5509 (COMP 5701) Méthodes pour la spécification de systèmes répartis  
CSI 5584 (COMP 5804) Programmation logique

**Theory of Computing**

COMP 5003 (CSI 5308)  
COMP 5005 (CSI 5390)  
COMP 5008 (CSI 5164)  
COMP 5107 (CSI 5185)  
COMP 5203 (CSI 5173)  
COMP 5306 (CSI 5100)  
COMP 5307 (CSI 5101)  
COMP 5308 (CSI 5102)  
COMP 5404 (CSI 5144)  
COMP 5408 (CSI 5121)  
COMP 5409 (CSI 5127)  
COMP 5703 (CSI 5163)  
COMP/MATH 5807 (CSI 5104)  
COMP 6601 (CSI 7160)  
COMP 6602 (CSI 7170, CSI 7970)

CSI 5107 (COMP 5609) Program Construction and Fault Tolerance  
CSI 5108 (COMP 5700) Software Specification and Verification  
CSI 5110 (COMP 5707) Principles of Formal Software Development  
CSI 5126 (COMP 5108) Algorithms in Bioinformatics  
CSI 5148 (COMP 5103) Wireless Ad Hoc Networking  
CSI 5149 (COMP 5007) Graphical Models  
CSI 5161 (COMP 5606) Topics in System Simulation and Optimization  
CSI 5162 (COMP 5702) Order: Its Algorithms and Graphical Data Structures  
CSI 5165 (COMP 5709) Combinatorial Algorithms  
CSI 5166 (COMP 5805) Applications of Combinatorial Optimization  
CSI 5169 (COMP 5304) Wireless Networks and Mobile Computing  
CSI 5174 (COMP 5604) Validation Methods for Distributed Systems  
CSI 5367 (COMP 5300) Structure in Complexity Theory

CSI 5507 (COMP 5609) Les programmes : construction et tolérance aux fautes  
CSI 5508 (COMP 5700) Spécification et vérification de logiciels  
CSI 5510 (COMP 5707) Principes de développement formel de logiciels  
CSI 5526 (COMP 5180) Algorithmes en bioinformatique  
CSI 5562 (COMP 5702) Ordre: algorithmes et structures graphiques de données.  
CSI 5565 (COMP 5709) Algorithmes combinatoires

**Computer Applications**

COMP 5002 (CSI 5128)  
COMP 5100 (CSI 5180, CSI 5580)  
COMP 5204 (CSI 5124)  
COMP 5206 (CSI 5183)  
COMP 5305 (CSI 5129)  
COMP 5306 (CSI 5100)  
COMP 5307 (CSI 5101)  
COMP 5308 (CSI 5102)  
COMP 5401 (CSI 5389 and CSI 5789)  
COMP 5406 (CSI 5105)  
COMP 5407 (CSI 5116)  
COMP 6604 (CSI 7162)

CSI 5114 (COMP 5504) Automated Office Systems  
CSI 5126 (COMP 5108) Algorithms in Bioinformatics  
CSI 5145 (COMP 5109) Statistical Approaches to Natural Language Processing

CSI 5146 (COMP 5202) Computer Graphics  
CSI 5147 (COMP 5201) Computer Animation  
CSI 5151 (COMP 5205) Virtual Environments  
CSI 5162 (COMP 5702) Order: Its Algorithms and Graphical Data Structures  
CSI 5168 (COMP 5309) Digital Watermarking  
CSI 5304 (COMP 5602) Knowledge Engineering  
CSI 5380 (COMP 5405) Systems and Architectures for Electronic Commerce  
CSI 5386 (COMP 5505) Natural Language Processing  
CSI 5387 (COMP 5706) Data Mining and Concept Learning  
CSI 5388 (COMP 5801) Topics in Machine Learning  
CSI 5514 (COMP 5504) Bureautique  
CSI 5526 (COMP 5180) Algorithmes en bioinformatique

CSI 5562 (COMP 5702) Ordre: algorithmes et structures graphiques de données.  
CSI 5580 (COMP 5100) Sujet en intelligence artificielle  
CSI 5780 (COMP 5405) Systèmes et architectures des logiciels pour le commerce électronique  
CSI 5787 (COMP 5706) Fouille des données et apprentissage des concepts

**Computer Systems**

COMP 5003 (CSI 5308)  
COMP 5009 (CSI 5141)  
COMP 5101 (CSI 5311)  
COMP 5102 (CSI 5312)  
COMP 5107 (CSI 5185)  
COMP 5203 (CSI 5173)  
COMP 5305 (CSI 5129)  
COMP 5401 (CSI 5389 and CSI 5789)  
COMP 5402 (CSI 5142)  
COMP 5406 (CSI 5105)  
COMP 5407 (CSI 5116)  
COMP 5704 (CSI 5131)  
COMP 6100 (CSI 7131)  
COMP 6602 (CSI 7170, CSI 6970)  
COMP 6605 (CSI 7163)

Programs

## Programs - Computer Science

CSI 5109 (COMP 5701)	Specification Methods for Distributed Systems
CSI 5114 (COMP 5504)	Automated Office Systems
CSI 5132 (COMP 5105)	Parallel Processing Systems
CSI 5133 (COMP 5608)	Simulation and Testing of Logic Circuits
CSI 5134 (COMP 5004)	Fault Tolerance
CSI 5143 (COMP 5403)	Real-time Systems Development
CSI 5147 (COMP 5201)	Computer Animation
CSI 5148 (COMP 5103)	Wireless Ad Hoc Networking
CSI 5161 (COMP 5606)	Principles of Distributed Simulation
CSI 5168 (COMP 5309)	Digital Watermarking
CSI 5169 (COMP 5304)	Wireless Networks and Mobile Computing
CSI 5170 (COMP 5800)	Distributed Data Processing
CSI 5171 (COMP 5303)	Network Architectures, Services, Protocols and Standards
CSI 5174 (COMP 5604)	Validation Methods for Distributed Systems
CSI 5380 (COMP 5405)	Systems and Architectures for Electronic Commerce
CSI 5509 (COMP 5701)	Méthodes pour la spécification de systèmes répartis
CSI 5514 (COMP 5504)	Bureautique
CSI 5780 (COMP 5405)	Systèmes et architectures des logiciels pour le commerce électronique

### Others

COMP 5900 (CSI 5140)
COMP 5901 (CSI 5901)
COMP 5902 (CSI 5900)
COMP 5903 (CSI 6900)
COMP 5904 (CSI 5902)
COMP 5905 (CSI 7999)
COMP 5906 (CSI 6001)
COMP 5907 (CSI 6002)
COMP 6901 (CSI 7901)
COMP 6902 (CSI 7900)
COMP 6907 (CSI 9998)
COMP 6908 (CSI 9997)
COMP 6909 (CSI 9999)

## Conflict Resolution

Department of Law  
Loeb Building C473  
Tel.: 613-520-3690  
[carleton.ca/law](http://carleton.ca/law)

### Graduate Certificate in Conflict Resolution

#### About the Program

The Department of Law offers a program of advanced study leading to a Graduate Certificate in Conflict Resolution. The Certificate provides an interdisciplinary program of study emphasizing the theory and practice of conflict analysis, prevention and intervention, with an emphasis on the Insight approach to conflict and Insight Mediation. The program has an academic structure and a professional orientation, and is directed toward individuals whose work involves dealing with conflict between individuals, within groups or between groups. The program develops in students both an intellectual foundation and applied skills that enable them to deal with conflict wisely. Interested students should contact the Department of Law for information concerning admission and program requirements, scheduled courses, and fee schedules.

## Cultural Mediations

Institute of Comparative Studies in Literature, Art and Culture (ICSLAC)

201 St. Patrick's Building

Tel.: 613-520-2177

carleton.ca/icslac

- Ph.D. Cultural Mediations

### Ph.D. Cultural Mediations

#### About the Program

The Ph.D. Cultural Mediations program is designed to support work in cultural theory of the twentieth century and the analysis of a variety of cultural practices across and between the participating disciplines. The program addresses those issues in cultural theory of the twentieth century that inform interdisciplinary work today in literature, film, music, art and new media: the nature of the text and textuality; the nature of representation, interpretation, meaning and affect; cultural identity and hybridity; the role of technologies of production and reception; the formation of the subject and modes of subjectivity; the functioning of ideology; the meaning and ethics of cultural value. Specific works of literature, film and other cultural practices, including new media, will be studied in relation to questions of theory. There are four fields of study in the program: Literary Studies, Visual Culture, Musical Culture, Technology and Culture.

#### Academic Regulations

See the General Regulations section of this Calendar.

Doctoral students are required to obtain a grade of B- or better in each course counted toward the fulfillment of the requirements of the degree.

#### Admission Requirements

The normal requirement for admission to the Ph.D. program is either a full-time or part-time capacity is an M.A. (or a recognized equivalent) in a discipline appropriate to the interdisciplinary strengths of the program.

A GPA of 10.0 (A-) or better is required of course work completed at the Master's level.

Appropriate disciplines might include English or French Literature, Art History, Film Studies, Music, Comparative Literature, Anthropology, Canadian Studies, Communication, Geography, History, Philosophy, Sociology, Gender Studies.

#### Program Requirements

Students admitted to the Ph.D. program in Cultural Mediations are required to complete a total of 10.0 credits as follows:

- 1.0 compulsory credit in CLMD 6101
- 1.0 credit from: CLMD 6102, CLMD 6103, CLMD 6104, CLMD 6105, CLMD 6106
- 0.5 compulsory credit in: CLMD 6900
- 0.5 additional credit
- 2.0 comprehensive credits
- 5.0 dissertation credits

#### Language Requirements

Upon graduation, each student is expected to be proficient in one language (preferably French) in addition to English. Additionally, students will

be expected to deal with all material that is their primary object of research in its original language. The graduate coordinator should be consulted about the fulfillment of language requirements.

#### Comprehensive Examinations

Students are required to pass two written comprehensive examinations. Each comprehensive has a 1.0 credit value:

1. The first comprehensive will be a general examination of the broad range of cultural theory of the twentieth century;
2. The second comprehensive will be a discipline-specific examination from one of the following four areas of specialization chosen by the student:
  - Literary Studies
  - Visual Culture
  - Musical Culture
  - Technology and Culture

#### Thesis

All students are required to complete a thesis in partial fulfillment of the requirements of the degree offered by the program. The thesis must be defended at an oral examination.

All students will be required to prepare, present and defend a thesis proposal before proceeding to the writing of the thesis. The proposal will be discussed and defended before the members of the thesis advisory committee at an oral defense chaired by the graduate supervisor.

The program appoints a doctoral thesis advisory committee, the chair of which shall be the student's thesis supervisor. The committee will consist of at least three members of the university faculty, at least two of whom will be core (or associate) faculty in the program. The advisory committee shall determine when a thesis may go forward for examination.



## Design

School of Industrial Design  
Mackenzie Bldg. 3470  
Tel.: 613-520-5672  
id.carleton.ca

- M.Design

### M.Design

#### About the Program

The MDes program strives to advance knowledge in the field of design through the study of advanced design principles and interdisciplinary design practices that contribute to the strategic value of design. The primary objectives of the program are to promote design research, interdisciplinary design development, strategic design planning, and knowledge creation and dissemination.

The program of study focuses on research in the following areas: advanced materials and manufacturing processes, advanced visualization, design and culture, design management, extreme environments, human-oriented design, product interaction design, sustainable design, and strategic design research.

Students have an opportunity to engage in interdisciplinary interactions with faculty from the School and faculty and students from a diverse range of disciplines in the university, all linked to the design development process. Graduates will have the skills to positively affect the greater integration of design principles, methodologies, and interdisciplinary design development processes into private and public sector business practice.

#### Academic Regulations

See the General Regulations section of this Calendar.

Industrial Design does not permit the C+ option as stipulated in Section 11.2 of the General Regulations.

#### Admission Requirements

The University's general requirements for admission are outlined in Section 2.1 of the General Regulations in the Graduate Calendar.

Applicants must have successfully completed a bachelor's degree in a design discipline, or the equivalent, with B- or better overall.

Applicants with a design-related background, but not a degree in design, will be required to demonstrate significant links between their academic background and professional experience in the design development process.

In addition to these academic credentials, applicants must submit the following materials to the School of Industrial Design:

- **Application Form**

- **Statement of Intent (One page)**

The quality of the statement of intent is critical to the likelihood of an applicant's admission. The writing should be succinct and as carefully considered as the content of the statement, which should address at least the four following areas:

What is the area of intended research with specific reference to the program courses and the expertise of the faculty members

How the applicant's academic background and

professional experience relates to the program with reference to any previous research, scholarship, or project experience with interdisciplinary or collaborative teams

How the intended research program will align with the objectives of the program relating to: design research, interdisciplinary design development, strategic design planning, knowledge creation and dissemination.

An explanation of the specific reasons for choosing the School of Industrial Design at Carleton University.

- **Portfolio**

The portfolio should provide the best examples of creative intellectual activity and recent professional work that indicates the applicant is sufficiently prepared to pursue studies in the program. These activities may be represented by proposals, reports, and/or analysis documents. Emphasis should be placed on evidence of understanding the communication of design ideas in visual form.

The presentation of the portfolio should be professional and facilitate the review process of the content, and should be submitted in prescribed format.

- **Two Letters of Recommendation**

Applicants must provide two (2) confidential letters of reference appended to prescribed recommendation forms.

- **Language Proficiency**

Proficiency in English is necessary to pursue graduate studies at Carleton University. All applicants are required to meet the requirements set out in Section 3.6 of the General Regulations of this Calendar.

- **Qualifying Year Program**

Candidates with admission deficiencies would be required to successfully complete additional prescribed courses to qualify for admission. Applicants without a degree in design may be required to register for up to 2.0 credits of courses selected from the undergraduate Bachelor of Industrial Design program, in consultation with the Graduate Program Coordinator.

All courses must be approved by the Graduate Program Coordinator of the School in consultation with the Faculty of Graduate Studies and Research. (See General Regulations Section 2.3, "Completion of the Qualifying Year", for more details.) Completion of the Qualifying Year is not a guarantee of admission to the Master of Design. Re-application to the M.Des. program is required.

#### Program Requirements

The Master of Design program requires the successful completion of 5.0 credits with at least 4.0 credits taken at the 5000 level or higher. The Graduate Program Coordinator must approve course selections. The program may be completed in four terms of study.

#### Specific requirements:

##### Year 1

##### Fall Term

- IDES 5101 Interdisciplinary Design Development Seminar
- IDES 5102 Research Methods

##### Winter Term

- IDES 5103 Interdisciplinary Design Development Studio
- 1.0 credit of elective courses

Programs - Design

**Year 2**

**Fall Term**

- IDES 5201 Thesis Proposal
- 0.5 credit elective course

**Winter Term**

- IDES 5909 Thesis

## Earth Sciences

Department of Earth Sciences  
2125 Herzberg Building  
Tel.: 613-520-5633  
earthsci.carleton.ca/ocgc

- M.Sc. Earth Sciences
- M.Sc. Earth Sciences with Specialization in Chemical and Environmental Toxicology (Specialization requirements listed under Chemical and Environmental Toxicology)
- Ph.D. Earth Sciences
- Ph.D. Earth Sciences with Specialization in Chemical and Environmental Toxicology (Specialization requirements listed under Chemical and Environmental Toxicology)

### M.Sc. Earth Sciences

#### About the Program

Established in 1982, the Ottawa-Carleton Geoscience Centre, a joint initiative of Carleton University and the University of Ottawa, offers programs leading to the degrees of M.Sc. and Ph.D. in Earth Sciences. The Centre houses modern instrumental facilities open to students at both campuses, and research activity includes most areas of the Earth Sciences. The campuses are fifteen minutes apart by complimentary inter-university transport and within a short distance of most federal facilities.

The size of the Centre's research faculty and its location in the nation's capital offer unique opportunities for collaborative research over a broad range of disciplines. Of particular note is the Centre's close collaboration with the Geological Survey of Canada and the Canadian Museum of Nature. Graduate students are enrolled in the university where their faculty supervisor holds an appointment but can take courses or use research facilities at both universities. Students draw from a program of courses in English or French and may pursue their research in either language.

#### Academic Regulations

See the General Regulations section of this Calendar.

A grade of B- or higher is required for each course counted towards the Master's degree.

#### Admission Requirements

The requirement for admission to the program is an Honours B.Sc. degree, with at least high honours standing, in geology or a related discipline.

#### Program Requirements

- 1.5 credit of course work, 0.5 credit of which may be at the senior undergraduate level
- A research thesis (3.5 credits) defended at an oral examination
- A public lecture, preceding the oral examination, which is based on the thesis research
- Participation in the OCGC Seminar Series (0.0 credit). Participation comprises one lecture (open to all members of the OCGC) describing an aspect of the candidate's research study and must be completed within 16 months of their registration in the M.Sc. program.

## Ph.D. Earth Sciences

#### About the Program

Established in 1982, the Ottawa-Carleton Geoscience Centre, a joint initiative of Carleton University and the University of Ottawa, offers programs leading to the degrees of M.Sc. and Ph.D. in Earth Sciences. The Centre houses modern instrumental facilities open to students at both campuses, and research activity includes most areas of the Earth Sciences. The campuses are fifteen minutes apart by complimentary inter-university transport and within a short distance of most federal facilities.

The size of the Centre's research faculty and its location in the nation's capital offer unique opportunities for collaborative research over a broad range of disciplines. Of particular note is the Centre's close collaboration with the Geological Survey of Canada and the Canadian Museum of Nature. Graduate students are enrolled in the university where their faculty supervisor holds an appointment but can take courses or use facilities at both universities. Students draw from a program of courses in English or French and may pursue their research in either language.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The requirement for admission to the Ph.D. Program is an M.Sc. degree in Earth Sciences or a related discipline. A grade of B- or higher is required for each course to be counted.

#### Program Requirements

- A research thesis (9.0 credits), defended at an oral examination before an examination board that includes an external examiner
- A public lecture, preceding the oral examination, which is based on the thesis research
- A minimum of 1.0 credit of course work at the graduate level. Additional courses may be prescribed by the thesis advisory committee
- A comprehensive examination conducted by the thesis advisory committee. The comprehensive examination includes the presentation of a thesis proposal and involves three areas of geoscience specialization chosen by the student's advisory committee and approved by the Director of the Ottawa-Carleton Geoscience Centre
- Participation in the OCGC Seminar Series (0.0 credit). Participation comprises one lecture (open to all Members of the OCGC) describing an aspect of the candidate's research study and must be completed within 16 months of their registration in the Ph.D. program.
- Residence Requirement - The residence requirement for the Ph.D. degree is at least four terms of full-time study.

## Economics

Department of Economics  
C870 Loeb Bldg.  
Tel.: 613-520-3743  
carleton.ca/economics

- M.A. Economics
- Ph.D. Economics

### M.A. Economics

#### About the Program

Master's students in economics undertake a thorough review of economic theory, together with an analysis of the Canadian economy, its institutions and history, and the working of public policy. Stress is placed on the understanding and application of quantitative methods to all aspects of economics. Although the program is generally oriented towards policy problems, there is considerable opportunity for the development of specialized interests.

#### Academic Regulations

See the General Regulations section of this Calendar.

A grade of B- or higher must normally be received in each credit counted towards the master's degree. With respect to the required core credits in the program, ECON 5000, ECON 5002, ECON 5005 and ECON 5006, there will be no exceptions. A candidate may, with the recommendation of the Department and the approval of the Dean of the Faculty of Graduate Studies and Research, be allowed a grade of C+ in up to 1.0 credit.

#### Admission Requirements

The normal requirement for admission to the master's program is a B.A. (Honours) (or the equivalent) in Economics, with an average grade of B+ or higher.

Applicants are expected to have had adequate preparation in microeconomic and macroeconomic theory, econometrics, and mathematics. This could be satisfied, for example, by having completed undergraduate courses in the following areas: advanced microeconomic theory, advanced macroeconomic theory, econometrics, mathematical analysis in economics, and statistical analysis in economics. Students with deficiencies in their preparation may have their program requirements extended accordingly.

The Department may require certain applicants to write the Graduate Record Examination Aptitude Test and the Advanced Test in Economics offered by the Educational Testing Service.

**Qualifying Year:** Applicants who lack the required undergraduate preparation may be admitted to a qualifying-year program designed to raise their standing to honours status. If successful, they may be permitted to proceed to the master's program the following year.

Refer to the General Regulations section of this Calendar for details of the regulations governing the qualifying year.

#### Program Requirements

All master's students in economics must fulfil the following requirements:

- ECON 5000, ECON 5002, ECON 5005

In addition, each candidate must select and complete one of the following:

- ECON 5006 and approved courses for 2.0 credits, 1.0 of which may be selected from among those

offered in a related discipline, with approval of the Department, through the M.A. Supervisor; or

- A thesis equivalent to 1.5 credits and approved courses for 1.0 credit.

#### Concentration in Financial Economics

Master's students in economics may pursue a concentration in financial economics, in which case they must fulfil the following requirements:

- ECON 5000, ECON 5002, ECON 5005, ECON 5051, ECON 5052

In addition, each concentration candidate must select and complete one of the following:

- ECON 5006 and approved courses for 1.0 credit, including at least one of ECON 5055, ECON 5058, ECON 5602, ECON 5608;

or

- A thesis equivalent to 1.5 credits.

All approved courses will normally be taken at the 5000 level.

#### Guidelines for Completion of Master's Degree

Full-time master's students are expected to complete their requirements within two terms. Part-time students will take a minimum of five terms but must complete within an elapsed period of six calendar years, as set out in Section 13 of the General Regulations of this Calendar.

#### Internship Placement

An Internship option is available to full-time students in the M.A. program who are eligible to work in Canada. Registration in the Internship option requires departmental permission and is limited by availability of placements. Application for an internship placement will be considered after the student completes ECON 5000, ECON 5002, ECON 5005, and ECON 5006, or after completion of 3.0 credits.

Internship placements will locate students for at least one term in the public service, the private sector, or non-governmental organizations. Students will integrate theoretical and applied economic analysis in their work experience. During their work term, students are required to register in ECON 5902 (Internship Placement), which is additional to the program requirements described above. While taking ECON 5902, students are considered to be part-time, and may register for at most 1.0 credit in total.

### Ph.D. Economics

#### About the Program

The doctoral program is offered jointly by the Departments of Economics at Carleton University and the University of Ottawa.

The Ph.D. program stresses the application of economic theory to the analysis of Canadian economic policy and economic development. Eight areas of specialization are available for intensive study and thesis research: econometrics, economic development, economics of the environment, industrial organization, international economics, labour economics, monetary economics, and public economics. The program of courses and thesis guidance, drawing upon the faculty of the two departments, will encompass course requirements, policy-oriented workshops,



comprehensive examinations, and a thesis. Students are expected to have, or to acquire, proficiency in mathematics and statistics before proceeding with the program.

#### Academic Regulations

See the General Regulations section of this Calendar.

Doctoral students must normally obtain a grade of B- or higher in each credit counted towards the degree.

#### Admission Requirements

The normal requirement for admission into the Ph.D. program is a master's degree (or the equivalent) from a recognized university with high honours standing. The Department may require certain applicants to write the Graduate Record Examination Aptitude Test and the Advanced Test in Economics offered by the Educational Testing Service.

In cases of exceptional merit, Ph.D. candidates may be accepted on a part-time basis.

#### Transfer from Master's to Ph.D. Program

A student who shows outstanding academic performance and who demonstrates high promise for advanced research during the master's program may, subject to meeting the requirements below, be permitted to transfer into the Ph.D. program without completing the M.A. program:

- The student will have completed ECON 5000, ECON 5002, and ECON 5005.
- The student must make formal application to the graduate studies committee.
- Students permitted to transfer into the Ph.D. program will be required to complete the equivalent of 13.5 credits of which 6.0 or 7.0 credits will be assigned to the Ph.D. Thesis, depending on the student's background and grades at the time of the transfer.
- Students who have taken ECON 6000 and/or ECON 6002 as part of the M.A. curriculum will be granted advanced standing in these courses.

#### Program Requirements

Notwithstanding additional course work that may be required by the admissions committee as a condition of entry, students admitted to the Ph.D. program are required to complete:

- 4.0 credits in ECON 6000, ECON 6002, ECON 6005, ECON 6900, ECON 6902, ECON 6905, ECON 6907, ECON 6908; and
- 2.0 credits in economics electives; and
- a thesis equivalent to 5.0 credits.

Students are also required to do course work in two of eight fields of specialization leading to a field comprehensive examination and the writing of a thesis. To fulfil this requirement, students must pass, within twenty-four months of beginning full-time study, at least two of the three courses associated with each of two chosen fields as well as a comprehensive examination in one of them (ECON 6905).

The courses in the eight fields of specialization are:

#### Econometrics

ECON 5712, ECON 5713, ECON 6714

#### Economic Development

ECON 5500, ECON 5504, ECON 5505

#### Economics of the Environment

ECON 5507, ECON 5803, ECON 5804

#### Industrial Organization

ECON 5301, ECON 5302, ECON 5303

#### International Economics

ECON 5601, ECON 5602, ECON 5603

#### Labour Economics

ECON 5361, ECON 5362, ECON 5363

#### Monetary Economics

ECON 5606, ECON 5607, ECON 5609

#### Public Economics

ECON 5401, ECON 5402, ECON 5403

#### Comprehensive Examinations

**Theory:** Each student will register in ECON 6900 and ECON 6902 in order to write the comprehensive examinations in microeconomic theory and macroeconomic theory. Both of these examinations must be successfully completed within twelve months of beginning full-time study. Students who fail to meet this requirement will normally be withdrawn from the Ph.D. program.

**Primary Field:** Each student will register in ECON 6905 in order to write a comprehensive examination in his or her chosen primary field. This examination must be successfully completed within twenty-four months of beginning full-time study. Students who fail to meet this requirement will normally be withdrawn from the Ph.D. program.

Although not compulsory, a candidate may be required by an examining committee to sit an oral examination.

#### Seminar Attendance

Students who have completed the comprehensive examinations in microeconomic and macroeconomic theory will be required to attend a minimum of eight departmental seminars in economics during each academic year until they have submitted their thesis to the Faculty of Graduate Studies and Research.

#### Thesis Requirements

Doctoral students will write and defend a Ph.D. thesis. In preparing the thesis, the student is required to give two thesis workshops. In the first (ECON 6907), a research proposal for the thesis will be presented for evaluation by at least three faculty members. In the second (ECON 6908), a substantial portion of the research for the thesis will have been completed and will be presented and evaluated by at least three faculty members.

#### Guidelines for Completion of Ph.D. Degree

Full-time Ph.D. students are expected to complete their requirements within four calendar years. Students who undertake the program by a combination of full-time and part-time study must complete their degree requirements within an elapsed period of eight calendar years, as set out in the General Regulations section of this Calendar.

## Electrical and Computer Engineering

Ottawa-Carleton Institute of Electrical and Computer Engineering  
 3034 Minto Bldg.  
 Tel.: 613-520-5659  
 ociece.ca

- M.A.Sc. Electrical and Computer Engineering
- M.Eng. Electrical and Computer Engineering
- Ph.D. Electrical and Computer Engineering

### M.A.Sc., M.Eng. Electrical and Computer Engineering

#### About the Program

The Ottawa-Carleton Institute for Electrical and Computer Engineering was formed in May 1983 combining the graduate programs and research activities in the area of electrical and computer engineering of the Department of Electronics, Carleton University, Department of Systems and Computer Engineering, Carleton University, and the School of Information Technology and Engineering, University of Ottawa.

Through the resources provided by the two universities, the Institute offers graduate programs at both master's and doctoral levels in all areas of electrical and computer engineering. The Institute for Electrical and Computer Engineering is one of a number of joint institutes/centers in science and engineering that have been established between the University of Ottawa and Carleton University.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission to a master's program is a bachelor's degree with at least high honours standing in electrical engineering or a related discipline.

#### Program Requirements

Subject to the approval of the departmental chair, a student may take up to half of the course credits in the program in other disciplines (e.g., Mathematics, Computer Science, Physics).

Master's programs with a thesis earn the Master of Applied Science degree, while other master's programs earn the Master of Engineering degree.

#### Master's Degree by Thesis (M.A.Sc.)

- 2.5 course credits plus 2.5-credit thesis

#### Master's Degree by Project (M.Eng.)

- 4.5 course credits plus a 0.5-credit project

#### Master's Degree by Coursework (M.Eng.)

- 5.0 course credits

#### Cooperative Master's Degree by Thesis (M.A.Sc.)

- 3.0 course credits plus a thesis. Participation in the Cooperative Master's program is subject to acceptance by a suitable sponsoring organization

#### Cooperative Master's Degree by Project (M.Eng.)

- 4.0 course credits plus two 0.5-credit projects Each project conducted in one of two work terms)
- Participation in the Cooperative Master's program is subject to acceptance by a suitable sponsoring organization.

## Ph.D. Electrical and Computer Engineering

#### About the Program

The Ottawa-Carleton Institute for Electrical and Computer Engineering was formed in May 1983 combining the graduate programs and research activities in the area of electrical and computer engineering of the Department of Electronics, Carleton University, Department of Systems and Computer Engineering, Carleton University, and the School of Information Technology and Engineering, University of Ottawa.

Through the resources provided by the two universities, the Institute offers graduate programs at both master's and doctoral levels in all areas of electrical and computer engineering. The Institute for Electrical and Computer Engineering is one of a number of joint institutes/centers in science and engineering that have been established between the University of Ottawa and Carleton University.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission into the Ph.D. program is a master's degree with thesis in electrical engineering or a related discipline.

#### Program Requirements

Subject to the approval of the advisory committee, a student may take up to half of the course credits in the program in other disciplines (e.g., Mathematics, Computer Science, Physics).

- A minimum of 1.5 course credits
- A comprehensive examination involving written and oral examinations and a written thesis proposal, to take place before the end of the fourth term of registration
- An 8.5-credit thesis which must be defended at an oral examination

### Graduate Courses

In all programs, the student may choose graduate courses from either university with the approval of the adviser or advisory committee. Course descriptions may be found in the departmental section of the calendar. All courses are of one term duration. Only a selection of courses listed is given in a particular academic year. The following codes identify the department offering the course.

#### Carleton University

- ELEC Department of Electronics
- SYSC Department of Systems and Computer Engineering

#### University of Ottawa

- EACJ School of Information Technology and Engineering

### Course List by Research Area

#### Biomedical Engineering

##### SCE

SYSC 5300 (ELG 6130)	Advanced Health Care Engineering
SYSC 5301 (ELG 6131)	Advanced Topics in Biomedical Engineering
SYSC 5302 (ELG 6321)	Biomedical Instrumentation

SYSC 5303 (ELG 6133)	Interactive Networked Systems and Telemedicine	SYSC 5135 (ELG 6305)	Ethics, Research Methods, and Standards
SYSC 5304 (ELG 5127)	Medical Image Processing	SYSC 5508 (ELG 6158)	Digital Systems Architecture
SYSC 5307 (ELG 6307)	Biological Signals	SYSC 5701 (CSI 5117)	Operating System Methods for Real-Time Applications
<b>SITE</b>		SYSC 5703 (ELG 6173)	Integrated Database Systems
EACJ 5127 (ELG 6131)	Advanced Topics in Biomedical Engineering	SYSC 5704 (ELG 6174)	Elements of Computer Systems
EACJ 5303 (ELG 5123)	Advanced Health Care Engineering	SYSC 5706 (ELG 6176)	Analytical Performance Models of Computer Systems
EACJ 5304 (ELG 5127)	Medical Image Processing	SYSC 5708 (ELG 6178)	Development of Real-Time and Distributed Software with Reusable Components
EACJ 6132 (ELG 6132)	Ethics, Research Methods, and Standards	SYSC 5709 (ELG 6179)	Advanced Topics in Software Engineering
<b>Computer Aided Design for Electronic Circuits</b>		SYSC 5806 (ELG 6186)	Object Oriented Design of Real-Time and Distributed Systems
<b>DOE</b>		SYSC 5807 (ELG 6187)	Advanced Topics in Computers Systems
ELEC 5401 (ELG 6341)	Signal Integrity in High-Speed Designs: Modeling and Analysis	<b>SITE</b>	
ELEC 5404 (ELG 6344)	Neural Networks for High-Speed/High-Frequency Circuit Design	EACJ 5102 (ELG 5197)	Introduction to Embedded Systems
ELEC 5405 (ELG 6340)	Advanced Linear and Nonlinear Circuit Theory and Applications	EACJ 5190 (ELG 5190)	Software Usability
ELEC 5504 (ELG 6354)	Analysis of High-Speed Electronic Packages and Interconnects	EACJ 5100 (ELG 5200)	Software Engineering Project Management
ELEC 5506 (ELG 6356)	Simulation and Optimization of Electronic Circuits	EACJ 5203 (ELG 5191)	Design of Distributed System Software
ELEC 5508 (ELG 6358)	Computer Methods for Analysis and Design of VLSI Circuits	EACJ 5204 (ELG 5124)	Virtual Environments
ELEC 5704 (ELG 6374)	Advanced Topics in CAD	EACJ 5205 (ELG 5125)	Quality of Service Management for Multi-media Applications
ELEC 5803 (ELG 6383)	Behavioural Synthesis of IC's	EACJ 5703 (ELG 5194)	Design and Testing of Reliable Digital Systems
<b>SITE</b>		EACJ 5705 (ELG 5195)	Digital Logic Design: Principles and Practices
EACJ 5705 (ELG 5195)	Digital Logic Design: Principles and Practices	EACJ 5807 (ELG 7186)	Topics in Computers I
<b>Computer and Software Engineering</b>		EACJ 5808 (ELG 7187)	Topics in Computers II
<b>SCE</b>		EACJ 5900 (ELG 7573)	Sujets choisis sur les ordinateurs
SYSC 5003 (ELG 6103)	Discrete Stochastic Models	<b>Computer Communications, Distributed Systems, and Multimedia</b>	
SYSC 5005 (ELG 6105)	Optimization Theory and Methods	<b>SCE</b>	
SYSC 5006 (ELG 6106)	Design of Real-Time and Distributed Systems	SYSC 5109 (ELG 6119)	Teletraffic Engineering
SYSC 5101 (ELG 6111)	Design of High Performance Software	SYSC 5201 (ELG 6121)	Computer Communication
SYSC 5102 (ELG 6112)	Performance Measurement and Modeling of Distributed Applications	SYSC 5207 (ELG 6127)	Distributed Systems Engineering
SYSC 5103 (ELG 6113)	Software Agents	SYSC 5306 (ELG 6136)	Mobile Computing Systems
SYSC 5104 (ELG 6114)	Methodologies for Discrete-Event Modeling and Simulation	SYSC 5403 (ELG 6143)	Network Access Techniques
SYSC 5105 (ELG 6115)	Software Quality Engineering and Management	SYSC 5502 (ELG 6152)	Advanced Linear Systems
SYSC 5108 (ELG 6118)	Topics in Information Systems	SYSC 5800 (ELG 6180)	Network Computing
		SYSC 5801 (ELG 6181)	Advanced Topics in Computer Communications

Programs - Electrical and Computer Engineering

SYSC 5808 (ELG 6188) Communications Network Management

**SITE**

EACJ 5009 (ELG 5383) Survivable Optical Networks

EACJ 5104 (ELG 5199) Design of Multimedia Distributed Database Systems

EACJ 5108 (ELG 5382) Switching and Traffic Theory for Integrated Broadband Networks

EACJ 5134 (ELG 5134) Computer Animation

EACJ 5200 (ELG 5120) Queueing Systems

EACJ 5202 (ELG 5122) Modeling, Analysis and Performance Evaluation in Computer Communications

EACJ 5206 (ELG 5126) Source Coding and Data Compression

EACJ 5208 (ELG 7185) Wireless Ad Hoc Networking

EACJ 5500 (ELG 5371) Digital Communications by Satellite

EACJ 5605 (ELG 7177) Topics in Communications I

EACJ 5606 (ELG 7178) Topics in Communications II

EACJ 5607 (ELG 5374) Computer-Communication Networks

EACJ 5369 (ELG 5369) Internetworking Technologies

EACJ 5384 (ELG 5384, CSI 5105, COMP 5406, LEG 5384) Network Security and Cryptography

**Digital and Optical Communications**

**DOE**

ELEC 5605 (ELG 6365) Optical Fibre Communications

ELEC 5606 (ELG 6366) Phase-Locked Loops and Receiver Synchronizers

**SCE**

SYSC 5200 (ELG 6120) Algebraic Coding Theory

SYSC 5503 (ELG 6153) Stochastic Processes

SYSC 5504 (ELG 6154) Principles of Digital Communication

SYSC 5506 (ELG 5170) Information Theory

SYSC 5605 (ELG 6165) Advanced Digital Communication

SYSC 5606 (ELG 6166) Introduction to Mobile Communications

SYSC 5607 (ELG 6167) Source Coding and Data Compression

SYSC 5608 (ELG 6168) Wireless Communications Systems Engineering

SYSC 5609 (ELG 6169) Digital Television

SYSC 5700 (ELG 6170) Spread Spectrum Systems

SYSC 5802 (ELG 6182) Introduction to Information and Systems Science

SYSC 5804 (ELG 6184) Advanced Topics in Communications Systems

**SITE**

EACJ 5002 (ELG 5380) Advanced Channel Coding

EACJ 5003 (ELG 5106) Fourier Optics

EACJ 5105 (ELG 5373) Data Encryption

EACJ 5106 (ELG 5113) Stochastic Systems

EACJ 5109 (ELG 5119) Stochastic Processes

EACJ 5131 (ELG 5131) Graphical Models

EACJ 5132 (ELG 5132) Smart Antennas

EACJ 5133 (ELG 5133) Introduction to Mobile Communications

EACJ 5300 (ELG 7114) Topics in Systems and Control II

EACJ 5301 (ELG 7574) Sujets choisis en systèmes et réglage automatique

EACJ 5360 (ELG 5360) Digital Watermarking

EACJ 5501 (ELG 5170) Information Theory

EACJ 5503 (ELG 5179) Detection and Estimation

EACJ 5504 (ELG 5372) Error Control Coding

EACJ 5506 (ELG 5375) Principles of Digital Communication

EACJ 5605 (ELG 7177) Topics in Communications I

EACJ 5606 (ELG 7178) Topics in Communications II

EACJ 5702 (ELG 7572) Sujets choisis en télécommunications et en traitement de signaux

EACJ 5704 (ELG 5180) Advanced Digital Communication

**Integrated Circuits and Devices**

**DOE**

ELEC 5402 (ELG 6342) Computer Methodologies for Digital and RF Design

ELEC 5502 (ELG 6352) Analog Integrated Filters

ELEC 5503 (ELG 6353) Radio Frequency Integrated Circuit Design

ELEC 5509 (ELG 6359) Integrated Circuit Technology

ELEC 5600 (ELG 6360) Digital Integrated Circuit Testing

ELEC 5703 (ELG 6373) Advanced Topics in Solid State Devices and IC Technology

ELEC 5705 (ELG 6375) Advanced Topics in VLSI

ELEC 5706 (ELG 6376) Submicron CMOS and BiCMOS Circuits for Sampled Data Applications

ELEC 5707 (ELG 6377) Microelectronic Microsensors and MEMS

ELEC 5800 (ELG 6380) Theory of Semiconductor Devices

ELEC 5801 (ELG 6381) High-Speed and Low-Power VLSI

ELEC 5802 (ELG 6382) Surface-Controlled Semiconductor Devices

ELEC 5804 (ELG 6384) VLSI Design

ELEC 5805 (ELG 6385) VLSI Design Project

ELEC 5808 (ELG 6388) Signal Processing Electronics



ELEC 5809 (ELG 6389)	Nonlinear Electronic Circuits	ELEC 5708 (ELG 6378)	ASICs in Telecommunications
<b>SCE</b>		ELEC 5709 (ELG 6379)	Advanced Topics in Electromagnetics
SYSC 5803 (ELG 6183)	Logic Programming	EACJ 5004 (ELG 5381)	Photonics Networks
<b>SITE</b>		EACJ 5201 (ELG 5103)	Optical Communications Systems
EACJ 5001 (ELG 5107)	Semiconductor Optical Logic	EACJ 5404 (ELG 7100)	Topics in Electromagnetics I
EACJ 5006 (ELG 7132)	Topics in Electronics I	<b>Signal, Speech and Image Processing</b>	
EACJ 5007 (ELG 7133)	Topics in Electronics II	<b>SCE</b>	
EACJ 5008 (ELG 7575)	Sujets choisis en électronique	SYSC 5304 (ELG 5127)	Medical Image Processing
EACJ 5103 (ELG 5198)	Parallel Processing with VLSI	SYSC 5370 (ELG 5370)	Multiresolution Signal Decomposition: Analysis and Applications
EACJ 5208/ELEC 5200 (ELG 6320)	Advanced Topics in Integrated Circuits and Devices	SYSC 5600 (ELG 6160)	Adaptive Signal Processing
		SYSC 5601 (ELG 6161)	Neural Signal Processing
<b>Microwaves and Electromagnetics</b>		SYSC 5602 (ELG 6162)	Digital Signal Processing
<b>DOE</b>		SYSC 5603 (ELG 6163)	Digital Signal Processing: Microprocessors, Software and Applications
ELEC 5409 (ELG 6349)	Microwave and Millimeterwave Integrated Circuits	SYSC 5604 (ELG 6164)	Advanced Topics in Digital Signal Processing
ELEC 5501 (ELG 6351)	Passive Microwave Circuits	<b>SITE</b>	
ELEC 5602 (ELG 6362)	Microwave Semiconductor Devices and Applications	EACJ 5360 (ELG 5360)	Digital Watermarking
ELEC 5604 (ELG 6364)	Radar Systems	EACJ 5370 (ELG 5370)	Multiresolution Signal Decomposition: Analysis and Applications
ELEC 5607 (ELG 6367)	Antennas and Arrays	EACJ 5385 (ELG 5385)	Matrix Methods and Algorithms for Signal Processing
ELEC 5608 (ELG 6368)	Fourier Optics	EACJ 5507 (ELG 5376)	Digital Signal Processing
ELEC 5609 (ELG 6369)	Nonlinear Microwave Devices and Effects	EACJ 5508 (ELG 5776)	Traitement numérique des signaux
ELEC 5707 (ELG 6377)	Microelectronic Sensors	EACJ 5509 (ELG 5378)	Image Processing and Image Communications
ELEC 5709 (ELG 6379)	Advanced Topics in Electromagnetics	EACJ 5600 (ELG 7172)	Topics in Signal Processing I
<b>SITE</b>		EACJ 5601 (ELG 7173)	Topics in Signal Processing II
EACJ 5305 (ELG 5108)	Electromagnetic Compatibility and Interference	EACJ 5603 (ELG 7179)	Topics in Signal Processing III
EACJ 5308 (ELG 7500)	Sujets choisis en électromagnétisme	EACJ 5800 (ELG 5377)	Adaptive Signal Processing
EACJ 5401 (ELG 5104)	Electromagnetic Waves: Theory and Applications	<b>Systems and Machine Intelligence</b>	
EACJ 5402 (ELG 5379)	Numerical Methods in Electromagnetic Engineering	SYSC 5001 (ELG 6101)	Simulation and Modeling
EACJ 5403 (ELG 5504)	Ondes électromagnétiques : théorie et applications	SYSC 5004 (ELG 6104)	Optimization for Engineering Applications
EACJ 5404 (ELG 7100)	Topics in Electromagnetics I	SYSC 5007/COMP 5007 (ELG 6107)	Expert Systems
EACJ 5405 (ELG 7101)	Topics in Electromagnetics II	SYSC 5401 (ELG 6141)	Adaptive and Learning Systems
EACJ 5406 (ELG 5779)	Méthodes numériques en génie électromagnétique	SYSC 5402 (ELG 6142)	Advanced Dynamics with Applications to Robotics
<b>Photonic Systems</b>		SYSC 5405 (ELG 6102)	Pattern Classification and Experiment Design
<b>DOE</b>		SYSC 5005 (ELG 5162)	Knowledge-Based Systems: Principles and Design
ELEC 5701 (ELG 6371)	Fibre and Waveguide Components for Communications and Sensors	<b>SITE</b>	
ELEC 5702 (ELG 6372)	Optical Electronics	EACJ 5100 (ELG 5163)	Machine Vision
ELEC 5705 (ELG 6375)	Advanced Topics in VLSI	EACJ 5204 (ELG 5124)	Virtual Environments
		EACJ 5207 (ELG 5161)	Robotics: Control, Sensing, and Intelligence

Programs - Electrical and Computer Engineering

EACJ 5209 (ELG 7113)	Topics in Systems and Control I
EACJ 5709 (ELG 5196)	Automata and Neural Networks
EACJ 7116 (ELG 7116)	Topics in System and Machine Intelligence: Introduction to Convex Optimization
EACJ 5386 (ELG 5386)	Neural Networks and Fuzzy Systems

## English

Department of English Language and Literature  
Dunton Tower 1812  
Tel.: 613-520-2311  
carleton.ca/english

- M.A. English
- Ph.D. English

### M.A. English

#### About the Program

Carleton's MA in English literature offers students the opportunity to explore the challenges and rewards of graduate school in a collegial and stimulating environment. The program effectively prepares students for the doctorate in English literature and may serve as a conduit to our own PhD in the Production of Literature, which concentrates on the production, circulation, and reception of texts in their institutional, technological, and discursive contexts. For those who do not want to pursue a PhD, the MA degree gives a competitive edge in the job market, whether in business, government, or the non-profit sector—in areas as diverse as publishing, human resources, communications, public relations, and marketing. Students with an MA also have an academic advantage when applying for professional qualifications and training in teaching, journalism, law, and library sciences.

#### Academic Regulations

See the General Regulations section of this Calendar.

A standing of B- or better must be obtained in each credit counted towards the master's degree.

#### Admission Requirements

The minimum admission requirement for the master's program is a B.A. (Honours) (or the equivalent) in English language and literature, with at least a high honours standing (normally B+ or better).

Possession of the minimum entrance standing is not in itself, however, an assurance of admission into the program.

#### Qualifying-Year Program

Applicants who hold a general (3-year) B.A. degree with at least a high honours standing (normally B+), with a major in English language and literature, may be admitted to the qualifying-year program. Normally, these students will be required to complete 4.0 or 5.0 credits in English, as determined by the department, and to maintain a high honours standing (normally B+) before being considered for admission into the master's program. For more information regarding the qualifying year, see the General Regulations section of this Calendar.

#### Program Requirements

Each candidate will select one of the following program patterns:

- 2.0 credits in English, selected from those at the 5000-level (excluding ENGL 5908), plus ENG 5005, and a master's thesis; an oral examination on the thesis will be required. A prospectus for the thesis must be submitted to the graduate committee by December 1 after registration in September, or at the end of three months for any other registration, or
- 3.0 credits in English selected from those at the 5000-level (excluding ENGL 5909), plus ENGL 5005, and a research essay; an oral examination on the research essay may be required, or

- 4.0 credits in English selected from those at the 5000-level (excluding ENGL 5908 and ENGL 5909), plus ENGL 5005.

Each program is designed to be completed within the three-term academic year. Each program is of equal status.

#### Guidelines for Completion of Master's Degree

Full-time master's candidates are expected to complete all requirements in twelve months or three terms of registered full-time study. Part-time master's candidates are expected to complete their degree requirements within an elapsed period of six calendar years after the date of initial registration.

### Ph.D. English

#### About the Program

Carleton's PhD program The Production of Literature is devoted to the study of the production, circulation, and reception of texts within and across established fields, historical periods, and genres. The Production of Literature recognizes books not only as objects to be interpreted but also as sociological events produced within a complex web of epistemological and political discourses, institutional practices, and changing technologies. This program is the only one of its kind in Canada in its unique commitment to fusing the investigation of manuscript, print, and digital cultures with the theoretical inquiry into literary and social production.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Academic standing

Doctoral students must normally obtain a grade of B- or better in each course counted toward the fulfilment of the degree requirements.

#### Admission Requirements

Applicants will normally hold a master's degree in English (or equivalent) with at least an A- average (10 G.P.A.)

Applicants judged to be deficient in preparation may be asked to complete course work in addition to the Ph.D. program requirements.

#### Program Requirements

Students admitted to the Ph.D. program are required to complete a total of 10.0 credits.

- 1.0 credit in ENGL 6000 Doctoral Seminar
- 0.5 credit in ENGL 6001 Proseminar
- 2.0 credits of approved courses
- 1.0 credit in ENGL 6900 comprehensive
- 1.0 credit in ENGL 6901 research project
- 4.5 credits in ENGL 6909 dissertation

ENGL 6000 and ENGL 6001 are required courses. Optional English courses will be selected from a list approved annually by the department. Students may take up to 1.0 credit of approved courses offered in other departments. Students may also choose directed reading courses with the core faculty of the program.

#### Comprehensive Examination and Research Project

Students are required to complete one comprehensive examination and one doctoral research essay. Each has a 1.0 credit value. The comprehensive examination (ENGL 6900) will focus on relevant theoretical and methodological issues and will take the form of a written examination set and marked by members

Programs - English

of core faculty. This will normally take place at the beginning of the second year of full-time doctoral study. The doctoral research project (ENGL 6901) will focus on the general historical period or conceptual issues of the candidate's research and will comprise a written research project of publishable length followed by an oral examination. This will normally be completed before the end of the second year of full-time studies.

**Language Requirements**

Candidates must demonstrate reading ability in a language other than English, normally by successfully completing a translation examination during the second year of full-time enrolment in the program.

**Thesis**

All students are required to submit a thesis proposal before proceeding to the writing of the thesis. The proposal must be approved by the graduate supervisor and the thesis committee. This will normally take place early in the third year of doctoral study. All students are required to complete a thesis (4.5 credits) in partial fulfilment of the requirements of the degree offered by the program. The thesis must be defended at an oral examination.

This program is designed to be completed in four years of full-time study. Students admitted to part-time study will normally complete all requirements within eight years of registration.



# Environmental Engineering

Ottawa-Carleton Institute for Environmental Engineering  
Minto Centre, Room 3090  
Tel.: 613-520-5659  
ociene.ca

- M.A.Sc. Environmental Engineering
- M.Eng. Environmental Engineering

## About the Program

Established in 2000, the Institute combines the research strengths and resources of the Department of Civil and Environmental Engineering at Carleton University and the Department of Civil Engineering and the Department of Chemical Engineering at the University of Ottawa. Programs leading to M.Eng., M.A.Sc. and Ph.D. degrees in Environmental Engineering are available through the Institute. Registration will be at the university with which the student's supervisor is affiliated. Related fields of study and research in environmental engineering are also available through the Ottawa-Carleton Institute for Civil Engineering (which offers graduate degrees in Civil Engineering) and the Department of Chemical Engineering at the University of Ottawa (which offers graduate degrees in Chemical Engineering).

## Admission Requirements

The requirement for admission to the master's program in Environmental Engineering is a four-year bachelor's degree in Environmental Engineering, other related engineering disciplines (Civil, Chemical, Mechanical, etc.), or Environmental Science disciplines.

All students entering the program are required to have courses in mathematics, probability and statistics equivalent to courses required in undergraduate engineering programs. Students admitted without full equivalency in these areas are expected to take appropriate undergraduate courses early in their studies. These courses will be additional to the normal degree requirements.

All students entering the program are also required to have taken undergraduate courses equivalent to the following:

Students registered at Carleton University

- MAAE 2300 Fluid Mechanics 1
- ENVE 3001 Water Treatment Principles and Design
- ENVE 3002 Environmental Engineering Systems Modeling

Students registered at the University of Ottawa in Chemical Engineering:

- CHG 3312 Fluid Flow
- CHG 3111 Unit Operations
- CHG 3127 Chemical Reactions Engineering

Students registered at the University of Ottawa in Civil Engineering

- CVG 2111 Introduction to Fluid Mechanics
- CVG 2131 Introduction to Environmental Engineering

These courses are considered to provide the minimum background in fluid mechanics, and in physical, chemical, and biochemical treatment principles, necessary to adequately follow environmental engineering courses at the graduate level. Depending on their background, students may have been exposed to these principles through a different combination of courses in their undergraduate curriculum. Students entering the program without an equivalent

background in these topics are expected to take these courses early in their studies and they are considered additional to those normally required for the degree.

## Program Requirements

Study at the master's level can be pursued through a thesis leading to a M.A.Sc., a project option leading to a M.Eng., or a coursework option leading to a M.Eng. The requirements for coursework are specified in terms of credits. At Carleton University, 1.0 credit typically comprises three hours of lectures or seminars a week for two terms, or the equivalent. At the University of Ottawa, 1.0 course credit is one hour of instruction per week for one term. Thus 1.0 credit in Carleton University notation is equivalent to 6 course credits in the University of Ottawa notation.

### Thesis Option (M.A.Sc.)

The requirements are:

- Completion of a minimum of 3.0 credits by course, with at least 0.5 credit from each of at least three of the areas of study listed below;
- Participation in the graduate seminar series (ENVE 5800) (0.0 credit);
- Completion and successful oral defence of a research thesis (ENVE 5909) (3.0 credits).

### Project Option (M.Eng.)

The requirements are:

- Completion of a minimum of 4.0 credits by course;
- Completion of a project (ENVE 5900) (1.0 credit);
- Participation in the graduate student seminar series (ENVE 5800) (0.0 credit).

### Coursework Option (M.Eng.)

The requirements are:

- Completion of a minimum of 5.0 credits by course;
- Participation in the graduate student seminar series (ENVE 5800) (0.0 credit).

### Breadth Requirement

In keeping with the objective of ensuring a breadth of knowledge for graduates of the program, students in the master's program are expected to take at least one graduate level course from each of at least three of the following areas of study:

- Air Pollution
- Water Resources Management, Groundwater Management and Contaminant Transport
- Management of Solid, Hazardous, and Radioactive Waste, and Pollution Prevention
- Water and Wastewater Treatment
- Environmental Impact Assessment

This requirement serves the objectives of educating graduate professionals who are not only specialized in one area but who are sufficiently familiar with problems and different approaches in the other areas to enable them to interact readily at a technical level with colleagues working in those areas. In addition to the courses associated with the individual areas, students will be encouraged to select courses from fundamental areas such as chemistry, numerical modeling, and applied statistics.

Master's candidates transferring from another university must take at least half their courses at the Institute.

## Ph.D. Environmental Engineering

### About the Program

Established in 2000, the Institute combines the research strengths and resources of the Department of Civil and Environmental Engineering at Carleton University and the Department of Civil Engineering and the Department of Chemical Engineering at the University of Ottawa.

Programs leading to M.Eng., M.A.Sc. and Ph.D. degrees in Environmental Engineering are available through the Institute. Registration will be at the university with which the student's supervisor is affiliated. Related fields of study and research in environmental engineering are also available through the Ottawa-Carleton Institute for Civil Engineering (which offers graduate degrees in Civil Engineering) and the Department of Chemical Engineering at the University of Ottawa (which offers graduate degrees in Chemical Engineering).

#### Admission Requirements

The normal requirement for admission into the Ph.D. Program in Environmental Engineering is completion of either:

- A Master's degree in Environmental Engineering, or a Master's degree in an engineering discipline with an environmental specialization.
- Students wishing to enter the program who do not have either of these backgrounds will be evaluated on a case-by-case basis. Additional course requirements may be specified in some cases.

#### Program Requirements

The requirements for the Ph.D. program (from a Master's degree) is the successful completion of 10.0 credits, of which 8.5 credits must be obtained from successful oral defence of a research thesis. The specific requirements are:

- Completion of a minimum of 1.5 credits by course
- Participation in the graduate student seminar series (ENVE 7800) [0.0 credit]
- Successful completion of the comprehensive examination, which consists of a presentation of a Ph.D. research proposal followed by an oral examination to assess any academic deficiencies in the student's background related to the proposed research project and to assess the originality and feasibility of the proposed research project. The comprehensive examination should be completed within the first 16 months (or the equivalent of four full-time terms) of the student's program
- Completion and successful oral defence of a research thesis (ENVE 6909) [8.5 credits]

Master's students with outstanding performance in the master's courses may request transfer into the Ph.D. program without completing the master's degree. Students who are permitted to do so require a minimum of 4.5 credits by course for a Ph.D., including any credits transferred from the Master's degree program. Ph.D. candidates transferring from another university must take at least half their courses at the Institute.

#### Graduate Courses

Course selection is subject to the approval of the adviser or the Advisory committee. Students may choose courses offered at either university from among those listed below.

The courses listed below are grouped by area of study. Master's students must complete at least one course in three of the five areas. The Director will decide when a course offered under a Special Topics or Directed Studies heading can be considered to meet the requirements of a given area. Course descriptions may be found in the departmental sections of the calendars concerned. Course codes in parentheses are for University of Ottawa (CHG and CVG), and those that begin with the prefix "ENVE" or "CIVE" are offered at Carleton. Only a selection of courses is given in a particular academic year.

Full course descriptions for courses offered at Carleton can be found in the relevant courses section of this calendar.

#### Air Pollution

ENVE 5101 (EVG 7101)	Air Pollution Control
ENVE 5102 (CVG 7161)	Traffic-Related Air Pollution
ENVE 5103 (CVG 7162)	Air Quality Modeling
ENVE 5104 (EVG 7104)	Indoor Air Quality
(CHG 8132) ENVJ 5105	Adsorption Separation Processes

#### Water Resources Management, Groundwater

##### Management, and Contaminant Transport

ENVE 5301 (EVG 7301)	Contaminant Hydrogeology
ENVE 5302 (CVG 7163)	Case Studies in Hydrogeology
ENVE 5303 (EVG 7303)	Multiphase Flow in Soils
CIVE 5504 (CVG 7108)	Seepage through Soils
(CVG 5124) CIVJ 5605	Coastal Engineering
(CVG 5125) CIVJ 5601	Statistical Methods in Hydrology
(CVG 5126) CIVJ 5602	Stochastic Hydrology
(CVG 5131) CIVJ 5606	River Engineering
(CVG 5160) CVJ 5503	Sediment Transport
(CVG 5162) CIVJ 5504	River Hydraulics
(CHG 8158) ENVJ 5304	Porous Media
ERTH 5403 (GEO 5143)	Environmental Isotopes and Groundwater Geochemistry
ERTH 5404 (GEO 5144)	Groundwater Resources
ERTH 5406 (GEO 5146)	Numerical Methods in Hydrogeology
ERTH 5407 (GEO 5147)	Geochemistry of Natural Waters
ERTH 5408 (GEO 5148)	Theory of Flow and Transport in Porous Media

#### Management of Solid, Hazardous, and Radioactive Waste and Pollution Prevention

ENVE 5201 (EVG 7201)	Geo-Environmental Engineering
ENVE 5202 (EVG 7202)	Contaminant Fate Mechanisms
ENVE 5203 (EVG 7164)	Hazardous and Radioactive Wastes
(CVG 5331) ENVJ 5902	Sludge Utilization and Disposal
(CVG 5133) ENVJ 5906	Solid Waste Disposal
(CVG 5179) ENVJ 5908	Anaerobic Digestion

#### Water and Wastewater Treatment

ENVE 5001 (CVG 7160)	Biofilm Processes
(CVG 5130) ENVJ 5900	Wastewater Treatment Process Design
(CVG 5132) ENVJ 5901	Unit Operations of Water Treatment
(CVG 5134) ENVJ 5907	Chemistry for Environmental Engineering

(CVG 5135) ENVJ 5608	Water Supply and Sanitation in Developing Countries
(CVG 5137) ENVJ 5905	Water and Wastewater Treatment Process Analysis
(CVG 5138) ENVJ 5902	Advanced Water Treatment
(CVG 5180) ENVJ 5909	Biological Nutrient Removal
(CVG 5232) ENVJ 5911	Unit Operation of Water Treatment Lab [0.25 credit]
(CVG 5238) ENVJ 5912	Advanced Water Treatment Processes Lab [0.25 credit]
(CHG 8181) ENVJ 5501	Biochemical Engineering
(CHG 8192) ENVJ 5502	Membrane Applications in Environmental Engineering
(CHG 8198) ENVJ 5503	Reverse Osmosis
<b>Environmental Impact Assessment</b>	
ENVE 5401(EVG 7401)	Environmental Impacts of Major Projects
(CVG 5139) ENVJ 5700	Environmental Assessment of Civil Engineering Projects

**Other Courses**

To fulfil the requirements beyond the 1.5 credits of area courses, students may choose from the following:

ENVE 5402 (EVG 7402)	Finite Elements in Field Problems
(CHG 8153) ENVJ 5500	Statistical Modeling and Control of Dynamic Processes
(CHG 8186) ENVJ 5506	Modeling of Steady-State Processes
(CHG 8194) ENVJ 5504	Membrane Separation Processes
(CHG 8195) ENVJ 5505	Advanced Numerical Methods in Transport Phenomena
(CHG 8196) ENVJ 5507	Interfacial Phenomena in Engineering
(CVG 5128) ENVJ 5604	Water Resources Planning and Policy
CIVE 5601 (CVG 7140)	Engineering Statistics and Probabilities
CIVE 5304 (CVG 7150)	Intercity Transportation
CIVE 5305 (CVG 7151)	Traffic Engineering
CIVE 5307 (CVG 7153)	Urban Transportation

Students may also, subject to approval, select courses from the graduate programs in Mechanical Engineering, Biology, Chemistry, Earth Sciences, Computer Sciences, Geography and Public Policy and Administration at both universities.

**Seminars, Directed Studies and Special Topics**

ENVE 5800	Master's Seminar
ENVE 5906 (EVG 6108)	Directed Studies 1
ENVE 5907 (EVG 6109)	Directed Studies 2
ENVE 7800	Ph.D. Seminar
ENVE 5701 (ENV 7301) - ENVE 5705 (ENV 7305)	Topics in Environmental Engineering

**Projects and Theses**

ENVE 5900	Environmental Engineering
ENVE 5909	Project
ENVE 5909	Master's Thesis
(EVG 6000) Engineering	Ph.D. Thesis
(EVG 7999)	Environmental Project
(EVG 9998) Examination	Master's Thesis
(EVG 9999)	Comprehensive
(EVG 9999)	Ph.D. Thesis

## European, Russian and Eurasian Studies

Institute of European, Russian and Eurasian Studies  
Dunton Tower 1311  
Tel.: 613-520-2888  
carleton.ca/eurus

- M.A. European, Russian and Eurasian Studies
- Diploma in European Integration Studies

### M.A. European, Russian and Eurasian Studies

#### Academic Regulations

See the General Regulations section of this Calendar.

Master's candidates must obtain a grade of B- or higher on each credit counted towards the degree.

#### Admission Requirements

The normal requirement for admission to the master's program is an honours degree (or equivalent), with at least a B+ average.

For admission to the program, applicants should normally meet the following requirements:

A B.A. Honours degree (or equivalent) in a humanities or social science discipline, with at least 3.0 credits in the European/Russian/Eurasian area covering three different disciplines (excluding language courses); and

A reading knowledge of an appropriate major European language (normally equivalent to two academic years of instruction, or one year with an intensive summer program) or, at the discretion of the Institute, equivalent knowledge of another of the region's languages. Applicants admitted with no proficiency or inadequate proficiency in an appropriate language will require additional language training beyond normal M.A. requirements.

Practical experience in the area of study will also be taken into consideration.

Applicants who do not have the required interdisciplinary background in the European/Russian/Eurasian area are encouraged to apply to the program, but additional coursework beyond the 5.0 credits may be required.

#### Qualifying Year

Applicants who have a general (three-year) bachelor's degree in one of the disciplines represented in the program, or who lack sufficient area studies or language training, may be admitted to a qualifying-year program designed to raise their status to that of honours graduates in European, Russian and Eurasian Studies. Students are expected to achieve a B+ average or better in the qualifying-year program in order to qualify for admission to the Master's year.

#### Program Requirements

1. Students in the program must complete 5.0 credits, consisting of the following:
  - EURR 5001, which is a 0.5-credit core seminar offered specially by the Institute. The course incorporates the approaches of several relevant disciplines and introduces students to a variety of methodological approaches and tools needed to design and implement research projects;
  - Selection of a concentration (either Russian, Eurasian and Transition Studies or European and European Union Studies), with 1.0 credit of course work from the concentration course list

provided below under the description of each concentration;

- Either EURR 5200 (recommended for students selecting the Russian, Eurasian and Transition Studies concentration), or EURR 5300 (recommended for students selecting the European and European Union Studies concentration);
- An additional 1.0 credit in coursework chosen with the approval of the graduate supervisor from the electives course list below;
- Either EURR 5908 (1.0 credit), a research essay related to the concentration, incorporating the approaches of at least two disciplines represented in the program; the research essay must be defended orally and combined with an additional 1.0 credit coursework chosen with the approval of the graduate supervisor from the electives course list below,

or

- EURR 5909 (2.0 credits), an M.A. thesis on a topic related to the concentration, which must combine interdisciplinary approaches with a greater degree of originality and a greater use of primary sources than that required of the research essay. The thesis must be defended orally. The thesis option cannot be taken without the specific permission of the graduate supervisor.
  - No more than 1.0 credit may be taken at the 4000-level. No more than 0.5 credit in a language discipline may be counted towards program requirements. If a student fulfils the language proficiency requirement by completing course work as outlined in point 2 below, 0.5 credit of a 4000-level course completed to fulfill that requirement may also count towards fulfillment of program requirements, so long as no more than 1.0 credit is taken at the 4000-level overall.
2. Completion of the language requirement:
    - Each student must demonstrate language proficiency. Students entering the M.A. program with no language proficiency or inadequate language proficiency will require extra coursework and/or summer language training to meet the language proficiency requirement.
    - For the Russian, Eurasian and Transition Studies concentration the student may select German, Polish, Russian, Ukrainian or Serbian/Croatian. For the European and European Union Studies concentration the student may select French, German, Italian, Polish or Spanish. A student may request permission to use another major language to fulfill this requirement. However, the requested language (a) must be utilized in undertaking research for the research essay or M.A. thesis; and (b) its selection must be approved by the graduate supervisor.
    - Proficiency in the approved language may be demonstrated by successful completion of a written translation examination to be administered by the Institute or by completion of the appropriate language from the following list with a minimum grade of B+: RUSS 4010 and RUSS 4020; GERM 4110; either SPAN 3110, or SPAN 3010 and SPAN 3020; ITAL 3110; or 1.0 credit in FREN at the 4000-level.

#### Guidelines for Completion of Master's Degree

Students in the 5.0-credit program with sufficient proficiency in Russian, German or another approved language are expected to complete the degree within



three to four terms of study. Students participating in international exchanges will normally require longer to complete degree requirements.

**Concentrations**

While one of the program's goals is to provide students with an integrative approach to the entire region, the concentration assures that each student's individual program will retain a particular focus. Europe and Eurasia have become increasingly integrated in terms of theoretical and methodological approaches. However, the two sub-regions covered by the program have distinct histories and legacies along with differing intellectual traditions. Selection of a concentration assures that each student's program will have an adequate level of intellectual coherence. Students studying the post-communist countries of Central and Eastern Europe that are EU member states or candidates for membership may select either concentration, depending on the thematic focus of the student's work.

The Institute offers two concentrations that draw systematically from the program's range of courses and expertise. Students are required to pursue one of these concentrations:

- Russian, Eurasian and Transition Studies
- European and European Union (EU) Studies

**Russian, Eurasian and Transition Studies**

This concentration involves an interdisciplinary focus on the communist legacy and challenges facing countries in transition, with a geographic scope covering eastern and southeastern Europe, Russia, Ukraine, Belarus, the Caucasus and post-Soviet Central Asia.

It is recommended that students pursuing this concentration complete EURR 5200 rather than EURR 5300.

Concentration course elective list: EURR 4002 or EURR 5002, EURR 4101, EURR 4205, EURR 4207, EURR 5005, EURR 5007, EURR 5008 EURR 5102, EURR 5107, EURR 5202, EURR 5203, EURR 5204, HIST 5600, PSCI 4501, PSCI 4503, PSCI 4601, PSCI 5104, PSCI 5105, PSCI 5106, SOCI 5804

**European and European Union Studies**

This concentration focuses on countries involved in the European Union and on European integration processes, consequences, and dynamics from an interdisciplinary perspective, including EU enlargement and relations of the EU with other states.

It is recommended that students pursuing this concentration complete EURR 5300 rather than EURR 5200.

Concentration course elective list: EURR 4006, EURR 5003, EURR 5005, EURR 5008, EURR 5102, EURR 5104, EURR 5105, EURR 5106, EURR 5108, EURR 5201, EURR 5204, EURR 5205, EURR 5302, INAF 5804, INAF 5805, PSCI 4501, PSCI 5503, HIST 5100, HIST 5200

**Electives Course List**

**Art History**

ARTH 4202 Topics in Eastern Medieval Art

**Economics**

ECON 5603, ECON 5806, ECON 5807

**History**

HIST 4600 Seminar in Russian History

HIST 5100, HIST 5200, HIST 5600, HIST 5800, HIST 5810, HIST 5811

**International Affairs**

INAF 5202, INAF 5206, INAF 5602, INAF 5804, INAF 5805

**Law**

LAWS 4806 The Civilist Tradition

**Political Science**

PSCI 4501 Gender and Politics in Post Communist Societies

PSCI 4503 Politics of Central Eurasia

PSCI 4601 Foreign Policies of Soviet Successor States

PSCI 5104, PSCI 5105, PSCI 5106, PSCI 5201, PSCI 5404, PSCI 5503, PSCI 5506, PSCI 5509, PSCI 5803, PSCI 5806

**Russian**

RUSS 4010 Fourth-Year Russian I

RUSS 4020 Fourth-Year Russian II

**Sociology**

SOCI 5804

**European, Russian and Eurasian Studies**

EURR 4006 European Integration and the Business Environment in East/Central Europe

EURR 4101 The Balkans

EURR 4205 Gender and Politics in Post-Communist Societies

EURR 4207 Politics of Central Eurasia

EURR 5000, EURR 5001, EURR 5002, EURR 5003, EURR 5005, EURR 5007, EURR 5008, EURR 5100, EURR 5102, EURR 5103, EURR 5104, EURR 5105, EURR 5106, EURR 5107, EURR 5108, EURR 5201, EURR 5202, EURR 5203, EURR 5204, EURR 5205, EURR 5301, EURR 5900, EURR 5901, EURR 5902, EURR 5903, EURR 5904, EURR 5905, EURR 5906

Other 4000- and 5000-level courses may be approved by the graduate supervisor as EURUS credits if they are deemed appropriate to a particular student's objectives.

**Co-operative Education Program in European, Russian and Eurasian Studies**

The co-op education program provides students in European, Russian and Eurasian Studies the opportunity to combine work terms with academic study. The practical experiences obtained in the workplace will reflect and extend knowledge and skills learned in the classroom, and will help to develop career interests and marketable expertise. All students in the M.A. Program in European, Russian and Eurasian Studies have the opportunity to enrol in the co-op education program.

**Admission Requirements**

Students interested in admission into the co-op education option must apply by the end of the first semester of academic study.

To be eligible for admission to the co-op option, students must:

- a) be registered in the M.A. in European, Russian and Eurasian Studies;
- b) have successfully completed, by the start-date of the first work term, the required first-year core classes (EURR 5001 or EURR 5001, and EURR 5200 or EURR 5300)
- c) be registered full-time in each academic term prior to work term.

d) be eligible to work in Canada (for off-campus work terms).

In addition, students whose first language is not English who are admitted to Carleton based on CAEL, IELTS or TOEFL assessments must also meet the following requirement: either a score of 6.0 on the CAEL Spoken English Test for Co-op students, or a score of 22 on the TOEFL test for spoken English, or a score of 6.5 on the IELTS test for spoken English.

Meeting the preceding requirements only establishes eligibility for admission to the co-op option – the prevailing job market may limit enrolment in it. Students should also note that hiring priority is given to Canadian citizens for co-op positions under the auspices of the Public Service Commission. Work terms for European, Russian and Eurasian Studies co-op students exist in a variety of public and private sector fields. Every effort will be made to ensure that there are appropriate work opportunities available, but there are no assurances that a co-op position will be found. Students with a high CGPA, enthusiasm, and potential, however, will have a competitive edge in securing co-op employment. Students will be assisted by the Carleton University Co-op Office to find work term positions.

#### Continuation

Students admitted to the co-op program will begin their first work term at the end of Year 1 and will rotate between academic and work terms through to the end of their program. Students must include two work terms in their program of study and may choose any combination of work terms.

The sequence of academic (A) / work (W) terms is as follows:

Calendar Year	Fall Term	Winter Term	Summer Term
Year 1	A	A	W1
Year 2	W2 or A	W3 or A	A
Year 3	A		

**Note:** students are permitted to enrol in one 0.5 credit course during each work term.

#### Registration

Students who are accepted into the Co-op Education Option in European, Russian and Eurasian Studies must be registered in one of the following courses in each work term:

EURR 5910 Work Term 1  
EURR 5911 Work Term 2

**Note:** these courses do not carry academic course credit, but are noted on academic transcripts.

#### Graduation

Students must successfully complete two work terms, in addition to the M.A. in European, Russian and Eurasian Studies requirements, to successfully graduate and receive a co-op designation on their final transcript and diploma.

#### Appeals

The Co-op Office administers the regulations and procedures applicable to the co-op option, and will report any situation of a student failing to report to a placement or being required to withdraw from the co-op option for any reason to the Director of the Institute of European, Russian and Eurasian Studies for a final decision. Any decision may be appealed through the normal channels of the University.

## Diploma in European Integration Studies

### About the Program

This diploma program is only open to students currently enrolled in a graduate degree program at Carleton University and is intended to provide an additional qualification to the student's main degree. Applications to the program should be made to the Institute of European, Russian and Eurasian Studies. Some previous coursework or practical experience in the field of European Studies is a prerequisite for admission to the program. The purpose of the diploma program is to supplement the student's program of study by providing in-depth study of processes of European integration from an interdisciplinary perspective and thus to prepare the student for professional work or further study in this field.

### Academic Regulations

See the General Regulations section of this Calendar.

### Program Requirements

Students must complete 2.5 credits of coursework and take part in a non-credit seminar EURR 5809.

Of the 2.5 credits required for the diploma, 1.0 credit must be unique to the diploma program and may not be counted toward meeting requirements for the student's main degree program. The unique diploma courses must include EURR 5003 and one additional course on the primary option list.

In addition to English, the student must demonstrate proficiency in a second European language (approved languages are subject to the discretion of the Institute), as certified by a language examination.

Up to 0.5 course credits towards the Diploma may be taken at another university, subject to the approval of the Director and the Faculty of Graduate Studies. In order to gain approval, such course work must be completed at a level equivalent to the 5000-level and its content must be relevant to the Diploma program.

**Note:** in order to be awarded the Diploma, students must apply to graduate with the Diploma at the same time as they apply to graduate with their M.A. or Ph.D.

### Required courses:

- EURR 5003 Social and Political Perspective in Europe
- EURR 5809 Seminar in European Integration Studies

### Primary Option List

At least two of the following:

- PSCI 5503 Topics in European Politics
- INAF 5804 International Relations in Europe
- INAF 5805 The E.U. in International Affairs
- EURR 5104 European Integration and European Security (also listed as PSCI 5608)
- EURR 5105 European Economic Integration
- EURR 5106 Selected Topics in European Integration Studies (also listed as PSCI 5609)
- EURR 5108 Canada-EU Relations: Summer Module (also listed as PSCI 5103)
- EURR 5302 EU Summer Study Abroad

**Secondary Option List**

One additional credit, which may include:

- ECON 5401 Public Economics: Expenditure
- ECON 5402 Public Economics: Taxation
- ECON 5601 International Trade: Theory and Policy
- ECON 5602 International Monetary Theory and Policy
- ECON 5806 Comparative Economic Systems I
- ECON 5807 Comparative Economic Systems II
- EURR 5102 The International Political Economy of Transition (also listed as INAF 5802)
- PSCI 5105 Post-Communist Politics in East Central Europe
- PSCI 5106 Selected Problems in the Politics of Soviet Successor States
- PSCI 5509 Governing in the Global Economy
- PSCI 5807 Analysis of International Organizations
- PSCI 5808 International Political Economy
- INAF 5308 International Trade: Theory and Policy
- INAF 5309 International Finance: Theory and Policy

Other 5000-level courses may be approved by the graduate supervisor as Diploma credits if they are deemed appropriate to the program.

## Film Studies

School for Studies in Art and Culture: Film Studies

Graduate Office

423 St. Patrick's Building

Tel.: 613-520-2342

carleton.ca/filmstudies

- M.A. Film Studies

### M.A. Film Studies

#### About the Program

The School for Studies in Art and Culture offers a program of study and research leading to the degree of Master of Arts in Film Studies. Priority is given to critical and historical concepts and methods pertaining to the study of media technology and aesthetics; national and transnational cinemas in their global contexts; Canadian and Quebec cinema; animation and new media; and film's relationship to literature, theatre, music and the visual arts.

#### Academic Regulations

See the General Regulations section of this Calendar.

A standing of B- or better must be obtained in each course counted towards the master's degree.

#### Admission Requirements

The minimum requirement for admission to the Master's program in either a full-time or part-time capacity is a B.A. (Honours) or the equivalent in film studies or a related discipline with high honours standing. Related disciplines might include mass communication, art history, literature, Canadian studies, women's studies, and history. Applicants without a background in film studies may be required to take a maximum of two full credits from designated courses in the undergraduate Film Studies program in addition to their normal M.A. program requirements.

Applicants who lack an Honours degree, but who have a three-year degree in film studies or a related discipline with a minimum standing of B+, may be admitted to a qualifying-year program. Students who complete the qualifying-year requirements with high honours standing or better will be considered for admission to the master's program. The regulations governing the qualifying-year are outlined in the General Regulations section of this calendar.

#### Program Requirements

Students enrolled in the Film Studies M.A. must select one of the following two program streams:

- 3.0 credits plus a 2.0 credit Thesis
- 5.0 credits Intensive stream

#### Thesis Stream

Five (5.0) credits:

- 1.0 credit FILM 5000 (core seminar)
- 2.0 additional credits
- 2.0 FILM 5909 (M.A. Thesis)

In choosing the 2.0 additional credits beyond the core seminars and the comprehensive exam, students may take 0.5 credits of coursework outside the Film Studies program subject to the approval of the Graduate Supervisor.

#### Intensive Stream

Five (5.0 credits):

- 1.0 credit FILM 5000 (core seminar)
- 0.5 credit FILM 5910 (Comprehensive Examination)
- 0.5 credit FILM 5805
- 2.0 additional credits (0.5 credit of which can include one of FILM 5801)
- 1.0 credit FILM 5908 Research Essay

In choosing the two additional credits beyond the core seminars and the comprehensive exam, students may take 0.5 credits of coursework outside the Film Studies program subject to the approval of the Graduate Supervisor.

#### Guidelines for Completion of M.A. Film Studies

- Full-time students in the thesis stream are expected to finish all requirements for the degree, with the exception of FILM 5909, during their first two terms of study, and part-time students by the end of the fifth term. The thesis requirement is designed to take two or three additional terms.
- Full-time students in the intensive stream are expected to finish all requirements for the degree, with the exception of FILM 5908 and FILM 5910, during their first two terms of study, and part-time students by the end of the fifth term. Full-time students are expected to complete the research essay by the end of the third term and part time students during the sixth term. Full-time students are expected to write the comprehensive exam during the third term and part-time students during the sixth term.

#### Thesis/Research Essay Proposal

- Students in the thesis stream will submit a detailed thesis proposal to the Film Studies Graduate committee no later than May 1 of the first year of registration for students enrolled full time and no later than the middle of the fifth term of registration for students enrolled part time.
- Students in the intensive stream will submit a research proposal that has been accepted by their research essay supervisor for approval no later than May 1. The topic should concern research undertaken after admission into the program.

#### Comprehensive Examination

The comprehensive examination will cover basic factual information concerning film history and the history of film theory, and questions relating to film theory and historiography, the critical debates in film studies, and approaches to film analysis. It will normally be undertaken during the Spring Term. A student may opt to write this exam during the Summer Term provided permission is granted by the Graduate Supervisor. Method of evaluation by letter grade.

#### Language Requirements

A reading knowledge of French (or another language approved by the Film Studies Graduate Supervisor) is required.



## French and Francophone Studies

Department of French  
Dunton Tower 1602  
Tel.: 613-520-2168  
carleton.ca/french

- M.A. French and Francophone Studies

### M.A. French and Francophone Studies

#### About the Program

The Department of French at Carleton University offers graduate students an intimate and collegial environment to pursue training at the MA level. The Department fosters a comparative and interdisciplinary approach to French and francophone studies. Our graduate students can choose from a variety of specializations across Francophone literatures and French linguistics. Seminars and research projects can focus on sociolinguistics or Caribbean literatures, Acadian French or French-based creoles, Québécois literature (including New France) and contemporary French fiction, among other topics. As active and published researchers in their respective fields, our faculty members promote student participation in a range of teaching and research activities. The Department is home to the Centre for Transnational Cultural Analysis, an interdisciplinary research unit, and also hosts a yearly graduate conference, organized by and for students. French and Francophone studies at Carleton gives students the opportunity to actively engage with the intellectual life of a dedicated group of scholars and students.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Academic Standing

A grade of B- or higher must be obtained in each course counted towards the master's degree.

#### Admission Requirements

The normal requirement for admission into the master's program is a B.A. (Honours) in French with at least high honours standing (normally B+ or better in Honours subject; B- or better overall).

#### Qualifying Year

Applicants who hold a general (3-year) bachelor's degree with at least B standing or higher, with a major in French, are required to register in the qualifying-year program (normally 5.0 credits in French chosen from those numbered at the 4000-level), and maintain at least B+ standing overall, before proceeding to the M.A. program.

Qualifying-year students should consult the Undergraduate Calendar and the departmental website for a listing of 4000-level courses.

#### Program Requirements

The requirement for the Master of Arts in French is 4.5 credits.

FREN 5300 and FREN 5301 are mandatory for all students and are to be taken in the first and second terms of study.

Candidates select from one of three program options, chosen in consultation with an adviser from the Department, normally the Supervisor of Graduate Studies.

#### Comprehensive Examination Program

- 1.0 credit in FREN 5907 Comprehensive Examination
- 0.5 credit in FREN 5300 Méthodologie de la recherche
- 0.5 credit in FREN 5301
- 2.5 credits at the 5000-level

#### Research Essay Program

- 1.0 credit in FREN 5908 Research Essay (Mémoire de recherche)
- 0.5 credit in FREN 5300 Méthodologie de la recherche
- 0.5 credit in FREN 5301
- 2.5 credits at the 5000-level

#### Thesis Program

- 2.0 credits in FREN 5909
- 0.5 credit in FREN 5300 Méthodologie de la recherche
- 0.5 credit in FREN 5301
- 1.5 credits at the 5000-level

With the approval of the Supervisor of Graduate Studies, M.A. students in French may select the equivalent of 1.0 credit at the graduate or 4000-level in French and at the 4000- or 5000-level in another department.

Students are restricted to a maximum of 0.5 credit in directed readings FREN 5800 (Lectures dirigées).

#### Guidelines for Completion of Master's Degree

Full-time students in the comprehensive examination and research essay options should be able to complete their program within three terms. Full-time students in the thesis option should be able to complete their program within five terms.

Students are required to submit a detailed proposal of their thesis, research essay or comprehensive exam. Full-time master's candidates are required to submit this proposal by the end of the ninth month of full-time registration.

## Geography

Department of Geography and Environmental Studies

Loeb Bldg B349

Tel.: 613-520-2561

Fax: 613-520-4301

[carleton.ca/geography/geography/graduate](http://carleton.ca/geography/geography/graduate)

- M.A. Geography
- M.Sc. Geography
- Ph.D. Geography
- Ph.D. Geography with Specialization in Political Economy (Specialization requirements listed under Political Economy)

### M.A. Geography

#### About the Program

The Department of Geography and Environmental Studies offers programs of study and research in geography leading to the degree of Master of Arts. Research on a wide variety of topics is possible.

Whatever a student's primary field of interest, the Carleton M.A. program promotes an integrative conception of Geography and encourages the crossing of inter- and intra-disciplinary boundaries. It also seeks to foster openness to a variety of philosophical and methodological approaches to geographical inquiry.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The requirement for admission into the master's program is a B.A.(Honours) or B.Sc. (Honours) in Geography or a related discipline, with at least B+ standing.

In exceptional cases, pertinent work experience may be considered in support of an application to the Department. Students entering the program from other disciplines or with academic deficiencies may be required to take additional courses.

#### Program Requirements

The following 5.0 credits:

- One of GEOG 5000 or GEOG 5001
- M.A. Thesis (2.5 credits) which must be defended at an oral examination
- GEOG 5905 - Masters Research Workshop
- 1.5 other credits
- In addition to the formal requirements, M.A. students are required to attend the Departmental Seminar series, and the Graduate Field Camp.

### M.Sc. Geography

#### About the Program

The Department of Geography and Environmental Studies offers programs of study leading to the degree of Master of Science. Subjects of research are in the natural and geographical information sciences, with substantive research clusters that provide critical mass for advanced inquiry. For more information about the research clusters, visit the Department of Geography and Environmental Studies graduate studies web page.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission into the M.Sc. program in Geography is a B.Sc. (Honours) or B.A. (Honours) in Physical Geography or a related discipline, with at least B+ standing.

Students entering the program from other disciplines or with academic deficiencies may be required to take additional courses.

The intended research area must be eligible for NSERC support.

Applicants for admission must provide an outline of their proposed project, which must be suitable for the M.Sc. program.

#### Program Requirements

The following 5.0 credits:

- GEOG 5001 Modeling Environmental Systems
- GEOG 5905 Masters Research Workshop
- GEOG 5906 M.Sc. Thesis (2.5 credits) which must be defended at an oral examination
- 1.0 credit in Physical Geography selected from:
  - GEOG 5103, GEOG 5104, GEOG 5107 GEOG 5303, GEOG 5307, GEOG 5800 GEOG 5803, GEOG 5804, GEOG 5900 GEOG 4004, GEOG 4013, GEOG 4017, GEOG 4101, GEOG 4103 GEOG 4104, GEOG 4108, GEOM 4003, GEOM 4008, or from courses offered by departments in the Faculty of Science.
- 0.5 credit free elective
- In addition to the formal requirements, M.Sc. students are required to attend the Departmental Seminar Series, and the Graduate Field Camp.

#### Notes

1. Only 0.5 credit towards the program may be obtained in GEOG 5900 - Graduate Tutorial.
2. Only 0.5 credit may be obtained at 4000 level.

### Ph.D. Geography

#### About the Program

The doctoral program in geography is structured around two fields:

- the geography of societal change with emphasis on the global political economy; restructuring and the environment; geographies of socio-cultural evaluation; feminist geographies
- the geography of environmental change with emphasis on environmental processes and anthropogenic impacts; appraisal and societal management of environmental resources.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission to the Ph.D. program is a master's degree (or the equivalent) in geography, with at least an A- average.

A student already registered in the M.A. or M.Sc. program who shows outstanding academic performance and research promise may be permitted to transfer to the Ph.D. program with a recommendation by the Departmental graduate committee.

Applicants whose academic preparation has deficiencies in certain areas may be admitted to the Ph.D. program with the requirement that they complete additional course work.

Admission to the Ph.D. program is granted on a full-time basis in September for the fall term.

**Program Requirements**

Program requirements for the Ph.D. degree are outlined in the General Regulations section of this Calendar. The specific program requirements of the Department of Geography and Environmental Studies are:

Ten (10.0) credits:

- GEOG 6000/GEOG 6001
- Either GEOG 6003/GEOG 6004 or GEOG 6006/GEOG 6007
- One written comprehensive examination in either GEOG 6906 or GEOG 6907
- Presentation and oral defence of the thesis proposal as outlined below
- A thesis equivalent to 8.0 of the required 10.0 credits which must be defended at an oral examination

**Comprehensive Examination**

Each doctoral candidate is required to write one comprehensive examination: GEOG 6906 or GEOG 6907, according to the chosen field of specialization

The comprehensive examination must be completed after course requirements for the Ph.D. have been completed. The examination will occur no later than the fourth term of registration in the Ph.D. program. Failure to complete the examination successfully will result in denial of permission to continue in the program.

**Thesis Proposal**

Candidates normally register in the thesis on entry to the program and work actively to define their research topic during the first term of registration. The thesis proposal is normally presented after comprehensive requirements have been fulfilled. Candidates submit and defend the thesis proposal at an oral examination no later than the end of the 5th term of registration in the Ph.D. program. Continuous registration is required after initial registration in the thesis.

**Residence Requirements**

All Ph.D. candidates must be registered full time in a minimum of six terms to satisfy the residence requirement.

## History

Department of History  
 Paterson Hall 430  
 Tel.: 613-520-2834  
 carleton.ca/history

- M.A. History
- M.A. Public History
- Ph.D. History
- Ph.D. History with Specialization in Political Economy (Specialization requirements listed under Political Economy)

### M.A. History

#### About the Program

At the M.A. level the Department of History offers two 5.0-credit programs: an M.A. in History, and an M.A. in Public History. Supervision is available in a wide variety of areas, including Canadian, American, Medieval, Early Modern and Modern European, British, Caribbean, Latin American, Atlantic World, Modern Asian, Sub-Saharan African, International, Public History, and the History of Women, Gender and Sexuality. For a more detailed description of professors' areas of research and supervision, see the departmental website.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The minimum requirement for admission to the master's program is an Honours bachelor's degree (or the equivalent) with at least high honours standing.

The Department offers no qualifying-year program; applicants with a general (three-year) degree may be considered for admission into the fourth year of Carleton's B.A. (Honours) program.

#### Program Requirements

Candidates may follow either a regular or Public History M.A. program, as follows:

##### M.A. History

###### Thesis option

- 1.0 credit in HIST 5002 and HIST 5003;
- 1.0 credit from HIST 5803, HIST 5804, HIST 5805, HIST 5806, HIST 5809 [1.0], HIST 5810, HIST 5811, HIST 5812, HIST 5813;
- 1.0 credit in a graduate history seminar or seminars in the student's major area of concentration or, with permission of the Department, a graduate course (0.5 credit) in the Department, plus a second graduate course (0.5 credit) in the Department or in another unit at Carleton University, or in the Department of History at the University of Ottawa;
- 2.0 credits in HIST 5909: M.A. Thesis.

###### Research Essay option

- 1.0 credit in HIST 5002 and HIST 5003;
- 1.0 credit from HIST 5803, HIST 5804, HIST 5805, HIST 5806, HIST 5809 [1.0], HIST 5810, HIST 5811, HIST 5812, HIST 5813;
- 1.0 credit in a graduate seminar or seminars in the student's major area of concentration; a seminar at the fourth-year level may be taken with permission of the Department.
- 0.5 credit in HIST 5900;
- 0.5 credit at the graduate level in HIST at Carleton, or, with permission of the Department, in another discipline at Carleton University, or in the

Department of History at the University of Ottawa.

- 1.0 credit in HIST 5908: M.A. Research Essay

### M.A. Public History

- 1.0 credit in HIST 5002 and HIST 5003;
- 0.5 credit from HIST 5803, HIST 5804, HIST 5805, HIST 5806, HIST 5809 [1.0], HIST 5810, HIST 5811, HIST 5812, HIST 5813;
- 0.5 credit in HIST 5700;
- 2.0 credits in public history courses, offered under the numbers HIST 5701 and HIST 5702. Up to 1.0 credit may be substituted by other appropriate courses in history (including another historiography course) or other units with the approval of the Department;
- HIST 5704: Internship in Public History (0.0 credit);
- 1.0 credit in HIST 5908: M.A. Research Essay.

M.A. students are required to submit thesis or research essay proposals to the graduate advisor during their second term of full-time enrolment. Part-time students should discuss the timing of this requirement with the Department.

#### Guidelines for Completion of Master's Degree

Full-time students in the thesis option are expected to finish all requirements for the degree except HIST 5909 during their first two terms of study. The thesis requirement is designed to take an additional two or three terms.

Full-time students in the research essay option are expected to finish all requirements for the degree except HIST 5908 during their first two terms of study. The research essay requirement is designed to take an additional term.

Full-time students in the M.A. in Public History are expected to complete HIST 5002 + HIST 5003, 1.0 credit in historiography, Introduction to Public History and one other Public History 0.5-credit course during the fall and winter terms, their internship during the summer term, and the two remaining Public History 0.5-credit courses and their research essay HIST 5908 during the fall and winter terms of the second year. Some flexibility will be allowed in the distribution of the Public History courses to facilitate choice. Part-time students should complete all degree requirements except the thesis within twelve terms of study.

#### Language Requirements

All candidates are required to demonstrate a reading knowledge of a language other than English, the choice to depend upon the field of the candidate's thesis or research. For seminars dealing with sources not in English, a reading knowledge of the appropriate language will be required before acceptance into the program. Details may be obtained from the supervisor of graduate studies.

### Ph.D. History

#### About the Program

The Department of History offers a program of study and research leading to the Doctor of Philosophy degree with a concentration in Canadian history or history of women, gender, and sexuality. Ph.D. candidates may be accepted in other areas depending upon the availability of appropriate supervision. For a description of professors' areas of research and supervision, see the departmental website.

#### Academic Regulations

See the General Regulations section of this Calendar.



**Admission Requirements**

Applicants with an M.A. degree will be expected to have at least high honours standing.

Applicants for the history of Women, Gender and Sexuality program will be expected to have at least one of their earlier degrees in history.

**Program Requirements**

Candidates will be responsible for three fields: a major field (normally Canadian history or history of Women, Gender and Sexuality) and two minor fields.

One of the minor fields for students in the Canadian history (major) field must concern American, British, French, Russian, modern or early modern European or international history.

At least one of the minor fields for students in the Women, Gender and Sexuality (major) field must concern American, British, Canadian, French, Russian, modern or early modern European or international history.

History of Women, Gender and Sexuality majors must declare their area of concentration from among these fields.

The second minor field for each major may be a transnational topic or in a related discipline. In each instance, the minor field should cover approximately one century.

Written examinations will be taken in the minor field before the end of the student's second term in the minor; an oral examination in the major field will be arranged during the student's fourth term.

Ph.D. candidates are required to submit a thesis proposal to the graduate supervisor within three months of completing their oral examination.

Students will complete:

- HIST 6808
- HIST 6906 Ph.D. Tutorials
- HIST 6907 Ph.D. Comprehensive, an oral comprehensive examination in the declared major field
- HIST 6100, HIST 6200, HIST 6400, or HIST 6500 (or HIST 6901 if the student is not in the Canadian major), plus a second of these courses or HIST 6600 (or HIST 6903 if the student is not in the Women, Gender and Sexuality major), or an approved course of studies in a related discipline, but excluding the declared area of the major field.
- HIST 6909 Ph.D. Thesis in the declared major field (5.0 credits)

**Guidelines for Completion of Doctoral Degree**

It is expected that full-time students will complete the thesis requirement within two years, and part-time students within four years.

**Language Requirements**

A reading knowledge of French will be required. Proven competence in an additional language or languages will be required if it is pertinent to the candidate's program. The language examinations will be written early in the first post-M.A. year, and before the field examinations.

**Residence Requirement**

The normal residence requirement for the Ph.D. degree is a minimum of three years of full-time study after the B.A. (Honours) degree, or two years after the M.A. degree.

**University of Ottawa**

A Carleton University student may take one seminar in the Department of History at the University of Ottawa, with permission of the two departments.

## Human-Computer Interaction

Carleton School of Information Technology  
230 Azrieli Pavilion  
613-520-2600, ext 1795  
hcdegree.carleton.ca

- M.A. Human-Computer Interaction
- M.A.Sc. Human-Computer Interaction
- M.C.S. Human-Computer Interaction

### M.A., M.A.Sc., M.C.S. Human-Computer Interaction

#### About the Program

The Master of Human-Computer Interaction (HCI) degree is open to students from a wide variety of disciplinary backgrounds in the human, technological, or engineering sciences. It offers students an opportunity to explore their native discipline in more depth while also gaining insight into the language and constraints under which specialists in other disciplines in the HCI field work. The degree prepares all students for direct entry into a career in HCI, bringing cross-disciplinary skills in quantitative and qualitative laboratory and field research that are increasingly sought after in industry and government. While no Ph.D. program is offered in HCI at Carleton as yet, qualified students who wish to continue their studies beyond a Master's degree may apply in the Ph.D. programs of their native discipline.

#### Admission Requirements

Applicants for the HCI M.A. program will normally hold an Honours degree or equivalent professional degree in Arts, Social Sciences, Business, or related areas with Highest Honours. Applicants for the M.A.Sc. program will normally hold an Honours degree in Engineering, Architecture, Design, or related areas with Highest Honours. Applicants for the M.C.S. degree will normally hold an Honours degree in Computer Science. Applicants with a background in Cognitive Science will be considered for whichever of the three programs is appropriate to their particular academic background.

Applicants judged to be generally acceptable but deficient in some preparation may be asked to complete course-work in addition to the program requirements.

In addition to transcripts and letters of reference, application packages will include a statement of interest outlining the applicant's proposed area of research.

#### Program Requirements

The HCI program comprises 5.0 credits of which 3.0 credits are devoted to course work, and 2.0 credits to a thesis.

Every student must enroll in one of three streams, Master of Arts, Master of Applied Science, or Master of Computer Science, depending on their native discipline.

#### M.A. Human-Computer Interaction

- 0.5 credit in HCIN 5100/ PSYC 5105 Fundamentals of HCI design and evaluation
- 0.5 credit in HCIN 5200 Software and User Interface Development
- 0.5 credit in HCIN 5300 Interactive Entertainment Technologies

Students in the M.A. stream must also complete one of the following:

- 0.5 credit in HCIN 5401/CGSC 5002 Experimental Research in Cognition
- 0.5 credit in HCIN 5402/GEOG 5003 Practising Human Geography
- 0.5 credit in HCIN 5403/ PSYC 5106 Research Methods in HCI
- 1.0 credit (normally two 0.5-credit courses) from a wide range of available electives with the guidance and permission of the supervisor of graduate studies.
- 2.0 credits in HCIN 5909 M.A. Thesis in HCI

#### M.A.Sc. Human-Computer Interaction

- 0.5 credit in HCIN 5100/ PSYC 5105 Fundamentals of HCI design and evaluation
- 0.5 credit in HCIN 5200 Software and User Interface Development
- 0.5 credit in HCIN 5300 Interactive Entertainment Technologies

Students in the M.A.Sc. stream must also complete one of the following:

- 0.5 credit in HCIN 5404/IDES 5102 Design Research Methods
- 0.5 credit in HCIN 5405/SYSC 5104 Methodologies for Discrete-Event Modelling and Simulation
- 1.0 credit (normally two 0.5-credit courses) from a wide range of available electives with the guidance and permission of the supervisor of graduate studies.
- 2.0 credits in HCIN 5909 M.A.Sc. Thesis in HCI

#### M.C.S. Human-Computer Interaction

- 0.5 credit in HCIN 5100/ PSYC 5105 Fundamentals of HCI design and evaluation
- 0.5 credit in HCIN 5200 Software and User Interface Development
- 0.5 credit in HCIN 5300 Interactive Entertainment Technologies
- 0.5 credit in HCIN 5406/COMP 5104 Object-Oriented Software Development
- 1.0 credit (normally two 0.5-credit courses) from a wide range of available electives with the guidance and permission of the supervisor of graduate studies.
- 2.0 credits in HCIN 5909 M.C.S. Thesis in HCI

## Information and Systems Science

Information and Systems Science Committee

Room 3034, Minto Centre

Tel.: 613-520-5659

- M.Sc. Information and Systems Science (Computer Science, Mathematics, Systems Engineering)

### M.Sc. Information and Systems Science (Computer Science, Mathematics, Systems Engineering)

#### About the Program

The purpose of the program is to provide training in the use and application of computers, to those who have not studied extensively in this field at the undergraduate level. The process of using the computer in problem solving is stressed. The program is flexible, though individual concentrations are usually in one of three broad areas:

- computer applications in a particular field (e.g., communications, energy systems)
- algorithms and methodologies for solution of complex problems by computer (e.g., graph theory, operations research, optimization, simulation and modeling)
- computer methods and technologies (e.g., databases, software engineering, computer languages)

Close links are maintained with the scientific, industrial, and technological communities, and an effort is made to direct students to project work of current practical significance.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

Applicants should have an Honours bachelor's degree, or equivalent, with at least high honours standing, in mathematics, engineering, physics, chemistry, computer science, operations research, experimental psychology, econometrics, management science, or a related discipline.

Undergraduate preparation should include a minimum of five half-credit courses in computing, and a minimum of five half-credit courses in mathematics.

Admission to the program will be made through one of the three participating units. Since space, laboratory facilities and supervision will be provided by one of the units, students should apply through the unit with which they wish to be most closely associated.

#### Program Requirements

The normal program comprises 4.0 credits and a 1.0 credit project; course requirements may be increased or decreased, depending upon the individual student's background.

Upon the approval of the Committee, a student demonstrating strong research potential may be permitted to substitute a 2.0 credit thesis in place of 1.0 course credit and the 1.0 credit project.

Students must take at least 1.0 credit from the department in which they are registered, and at least 0.5 credit from each of the other two participating units. Students must also take course ISYS 5802.

Each student should consult with his/her faculty adviser in the selection of a course pattern related to his/her principal area of interest.

Each candidate submitting a thesis will be required to undertake an oral examination on the subject of his/her thesis.

Course work may be completed on either a full-time or part-time basis. Thesis research normally requires full-time residence at the University; however, a candidate may be permitted to carry out thesis work off campus provided that suitable arrangements are made for supervision and experimental work, and prior approval is given by the Committee.

#### Guidelines for Completion of Master's Degree

Full-time students in the M.Sc. in Information and Systems Science will normally complete the degree requirements in two years and part-time students within four years. In order to meet this goal, full-time students should arrange a project or thesis supervisor within the second term of study, and should try to complete the course requirements as quickly as possible.

#### Course Selection

Due to the interdisciplinary nature of ISS, a student will, in some cases, benefit by taking an undergraduate course at the 3000- or 4000-level as part of his/her program. Where a 3000-level course is to be taken, it will be extra to the degree requirements; or else arrangements will be made to enrich the subject matter, normally through a directed study course with the professor. Students may include 1.0 credit at the 4000-level in their program without penalty, with the approval of the unit.

Note: students in this program are prohibited from taking COMP 3804 Design and Analysis of Algorithms due to overlap of course material with ISYS 5802.

## Infrastructure Protection and International Security

Infrastructure Protection and International Security Committee

3452 Mackenzie Building  
613-520-2600 x1228

- M. Infrastructure Protection and International Security

### M. Infrastructure Protection and International Security

#### About the Program

MIPIS is designed to offer students a cross-disciplinary understanding of critical infrastructure protection (CIP) challenges. Students with an engineering background, in addition to specializing in infrastructure engineering design, mitigation, and management, will take courses in national security policy, CIP risk management, intelligence and terrorism. Students with a policy background will reinforce their national security policy, intelligence, and terrorism expertise with an understanding of infrastructure engineering design and mitigation.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The minimum requirement for admission into the Master's program is a B.A. (Honours) degree in a discipline related to International Affairs or a Bachelor's degree in Engineering. Students will normally be expected to have high honours standing to be considered for admission into the program.

In conformity with the Faculty of Graduate and Postdoctoral Affairs, applicants whose first language or language of instruction for their first degree is not English must be tested for proficiency in English as specified in the General Regulations section of this Calendar.

Students admitted to the M.I.P.I.S program must have successfully completed at least 0.5 credit in microeconomics or engineering economics, and must demonstrate some capacity in basic mathematics. Students who have not successfully completed senior secondary school mathematics will have their admission into the program made conditional upon successful completion of MATH 0005 (Precalculus: Functions and Graphs). Students who have not successfully completed introductory microeconomics or engineering economics at the time of their application will have their admission into the program made conditional upon successful completion of ECOR 3800 (Engineering Economics) or an equivalent course.

#### Program Requirements

Students in the M.I.P.I.S. program are required to successfully complete a total of 5.0 credits. Additional requirements may be stipulated, depending on the background of the individual student.

Students have the choice of several program options:

- 5.0 credits of course work only
- 4.0 credits of course work and a 1.0 credit research project
- 4.0 credits of course work and a 1.0 credit research essay.

Unless otherwise specified with a [1.0] following the course number, courses carry a value of 0.5 credit. All masters students are required to complete five credits:

2.0 credits in:

- IPIS 5101 Critical Infrastructure Protection: Issues and Strategies
- IPIS 5102 Introduction to Infrastructure Management
- IPIS 5103 Infrastructure Engineering Principles
- IPIS 5104 Terrorism and International Security (INAF 5244)

1.0 credit from:

- IPIS 5301 Disarmament, Arms Control and Nonproliferation (INAF 5201)
- IPIS 5302 International Security after the Cold War (INAF 5202)
- IPIS 5303 Intelligence Statecraft and International Affairs (INAF 5204)
- IPIS 5304 Intelligence and National Security: Policies and Operations (INAF 5224)
- IPIS 5305 National Security Policy and Law (INAF 5234)
- IPIS 5320 Topics in Infrastructure Security

1.0 credit from:

- IPIS 5501 Transportation and Aviation Security
- IPIS 5502 Infrastructure Assets Management
- IPIS 5503 People in Fires (CIVE 5611)
- IPIS 5504 Fundamentals of Fire Safety Engineering (CIVE 5609)
- IPIS 5505 Geohazards
- IPIS 5506 Public Health Safety
- IPIS 5507 Blast-load Effects on Structures
- IPIS 5520 Topics in Engineering of Critical Infrastructure

1.0 credit remaining may be selected as follows:

#### Coursework Program Option:

- 1.0 credit from (a) graduate courses listed above, or courses offered by the Faculty of Engineering or the Faculty of Public Affairs that have been selected in consultation with, and approved by, the MIPIS Director and Associate Director.

#### Research Project Option:

- 1.0 credit in IPIS 5907 [1.0] Infrastructure Engineering Project

#### Research Essay Option:

- 1.0 credit in IPIS 5908 [1.0] Research Essay



## International Affairs

Norman Paterson School of International Affairs  
1401 Dunton Tower  
Tel.: 613-520-6655  
carleton.ca/npsia

- M.A. International Affairs
- M.A. International Affairs/LL.B.
- Ph.D. International Affairs

### M.A. International Affairs

#### About the Program

The Norman Paterson School of International Affairs (NPSIA) was established in the mid-1960s with the generous support of the late Senator Norman M. Paterson to encourage and promote graduate study and professional research and publications in the field of international affairs. The NPSIA program is interdisciplinary, reflecting the philosophy that exposure to a range of disciplines is necessary to develop an understanding of our complex global environment.

#### Academic Regulations

See the General Regulations section of this Calendar.

A grade of B- or better must be obtained in each credit counted towards the master's degree. The School does not permit exceptions to this rule.

Students will be required to withdraw from the program if their grade point average falls below 7.0 (B-), or if they receive a grade of less than B- in any two courses that are eligible to be counted toward the Master's degree.

#### Admission Requirements

The minimum requirement for admission into the master's program is a B.A. (Honours) degree in a discipline related to international affairs.

Under current practice, at least a high honours standing (B+ minimum) is normally required to be considered for admission to the program.

Applicants may submit Graduate Record Examination aptitude test scores; in some circumstances, students may be required to submit GRE scores.

The Faculty of Graduate and Postdoctoral Affairs requires applicants whose native tongue is not English to be tested for proficiency in English. NPSIA applicants must submit a CAEL Assessment™ score of a minimum of 70 or a TOEFL score of 250 computer-based or 600 regular 100 iBT (minimum score of 25 in each of reading, writing, speaking and listening).

Students admitted to the NPSIA M.A. program must have successfully completed a 1.0 credit (or the equivalent) course in introductory economics (introductory microeconomics and introductory macroeconomics for economics majors) before starting the program.

Students who have not completed one credit of introductory economics at the time of their application will have their admission into the program made conditional upon its successful completion prior to registration. In some cases where the student is deemed by the admissions committee to have an insufficient background in international affairs they may be required to complete up to two additional courses as part of their M.A. program. Students who are uncertain about whether they meet the background requirements are encouraged to contact the School of International Affairs.

#### Qualifying Year

The qualifying-year program is designed to enable students with at least high honours standing, but with an inadequate background in the disciplines relevant to the M.A. program, to make up deficiencies. The qualifying year program is not intended as a grade raising opportunity. Candidates with a high standing in a general (3-year) bachelor's degree, in a discipline closely related to international affairs, will be required to take five full qualifying-year credits before being eligible to enter the master's program. Those with a B.A.(Honours) degree in an unrelated discipline may be required to take at least three full qualifying-year credits before being eligible to enter the master's program.

Students in the qualifying year are encouraged to select a cluster or clusters in which they are interested and to take courses that will prepare them for graduate work in that cluster. Courses in anthropology, economics, geography, history, law, political science, and sociology, among other disciplines, are recommended. Students may also wish to select an area emphasis and to take courses that will enable them, in the M.A. year, to engage in specialized study of a region having particular relevance to the cluster(s) they have identified. Students should also be cognizant of the language requirement at the M.A. level and, if necessary, take the appropriate courses to enable them to fulfil that requirement.

Students who have not previously completed a 1.0-credit (or equivalent) course in introductory economics (introductory microeconomics and introductory macroeconomics for economics majors) must do so as part of their Qualifying Year program.

Other courses will be selected in consultation with the Associate Director.

Admission to the qualifying year does not guarantee admission to the M.A. program. To be considered for admission to the M.A. program, students in the qualifying year are expected to achieve the equivalent of high honours standing. Students in the qualifying year are considered for admission to the M.A. program at the same time as other applicants; if qualifying-year students are not admitted to the M.A. program in the first round of admissions, subsequent decisions on their admission will depend on performance and the availability of space in the M.A. program.

Guidelines for Completion of Qualifying Year - Candidates admitted to the qualifying-year program on a full-time basis must complete all requirements during the fall and winter terms after initial registration.

#### Program Requirements - Full-time M.A.

The Master of Arts in International Affairs is a 5.0 credit program and students must select one of three program patterns:

- 2.0 credits in Thesis plus 3.0 credits course work
- 1.0 credit in Research Essay plus 4.0 credits course work
- 5.0 credits in Course Work

Most students are admitted to the full-time program and must complete all of the degree requirements within two calendar years or six terms of full-time study. In exceptional cases, students may complete the program within one calendar year.

All courses used for credit in the degree must be approved in advance by the Associate Director of the School.

**The specific requirements are:**

- INAF 5001: Policy and Methods [0.5 credit] which must be completed by the end of the second term.
- Successful completion, by the end of the second term, of one of the following 0.5 credit economics courses associated with the cluster selected: INAF 5009, INAF 5214, INAF 5205, INAF 5308, INAF 5309, INAF 5600, or INAF 5703. If the required course is not offered in a given year, or the student is deemed to have fulfilled the requirement by successfully completing an equivalent course, another economics course may be approved as a substitute.
- A compulsory 0.5-credit course associated with the cluster selected which must be completed by the end of the second term.
- An additional 3.5 credits (or the equivalent) which may be completed in one of the following ways: 3.5 credits of courses; 2.5 credits of courses plus a 1.0 credit research essay (INAF 5908); 1.5 credits of courses plus a 2.0 credit master's thesis (INAF 5909).
- 1.5 credits of the total required 5.0 credits may be selected from courses offered in other departments, with a maximum of 1.0 credit from a single department and a maximum of 1.0 credit selected from fourth year undergraduate courses. A minimum of 1.5 credits must be completed in each of the first two terms.
- A demonstrated ability to read a second major international language, or one appropriate to the primary research interests. Typically, for most English-speaking domestic students, the ability to read French will satisfy this requirement.

**Required Courses**

All students must complete:

- INAF 5001 Policy and Methods for International Affairs

In addition, one of the following seven designated economics courses must be selected:

- INAF 5009 International Aspects of Economic Development
- INAF 5205 Economics of Conflict
- INAF 5214 Economics for Defence and Security
- INAF 5308 International Trade: Theory and Policy
- INAF 5309 International Finance: Theory and Policy
- INAF 5600 Human Resource Development
- INAF 5703 Economics of Institutions and Global Governance

Note: students are required to take the economics course associated with their cluster as noted below. Candidates with sufficient economics training may be permitted to substitute other courses.

**Clusters**

NPSIA's M.A. program is organized around seven clusters. Each student must select a cluster and enrol in one of the designated cluster courses.

**International Trade Policy**

Designated economics course: INAF 5308

**Designated Courses:**

- INAF 5101 The Politics and Institutions of International Trade

- INAF 5306 Trade Policy in North America
- INAF 5400 Trade Policy Analysis
- INAF 5500 Comparative Trade Policy
- INAF 5507 International Economic Law
- INAF 5508 Law, Politics, and Economics in International Affairs

**Global Political Economy**

Designated economics course: INAF 5309

**Designated Courses:**

- INAF 5300 The Political Economy of Multinational Enterprises
- INAF 5401 International Financial Institutions and Policy
- INAF 5407 International Relations Theory
- INAF 5501 Global Political Economy
- INAF 5502 State Sovereignty and Globalization

**Conflict Analysis and Conflict Resolution**

Designated economics course: INAF 5205

**Designated Courses:**

- INAF 5108 Conflict Analysis
- INAF 5109 Conflict Management: Theory and Evidence
- INAF 5200 Peacebuilding and Reconstruction: Theory and Practice
- INAF 5203 International Mediation and Conflict Resolution
- INAF 5506 International Law: Use of Force

**Intelligence and National Security**

Designated economics course: INAF 5214

**Designated Courses:**

- INAF 5201 Disarmament, Arms Control and Nonproliferation
- INAF 5202 International Security after the Cold War
- INAF 5204 Intelligence, Statecraft, and International Affairs
- INAF 5224 Intelligence and National Security: Policies and Operations
- INAF 5234 National Security Policy and Law
- INAF 5244 Terrorism and International Security

**International Institutions and Global Governance**

Designated economics course: INAF 5703

**Designated Courses:**

- INAF 5405 International Organizations
- INAF 5505 International Law: Theory and Practice
- INAF 5701 Global Environmental Change: Human Implications
- INAF 5702 International Environmental Affairs
- INAF 5705 International Social Policy

- INAF 5805 The EU in International Affairs

### International Dimensions of Development

Designated economics course: INAF 5009

#### Designated Courses:

- INAF 5002 Issues in International Development
- INAF 5303 Science, Technology and International Affairs: The Third World
- INAF 5601 Social Theory and International Development
- INAF 5602 Development Assistance: Theory and Practice
- INAF 5609 Development Project Evaluation and Analysis
- INAF 5801 Regional Integration Among Developing Countries

### Human Security and Development

Designated economics course: INAF 5600

#### Designated Courses:

- INAF 5003 National and Domestic Dimensions of Development
- INAF 5006 Agriculture and Rural Development
- INAF 5209 Conflict and Development
- INAF 5408 Gender in International Affairs
- INAF 5704 Human Security: From Policy to Practice
- INAF 5706 Global Health Policy

#### Transfer from the Master's to the Ph.D. Program

Students in the full-time M.A. program who demonstrate outstanding academic performance and research potential may, with permission of the Associate Director, be admitted to the Ph.D. program after two terms of registration.

Students considering this option will be advised, when selecting courses for their M.A. program, to choose those courses at the master's level which are open to doctoral students and which may assist them in the doctoral comprehensive examinations.

#### Co-op Option

Full-time M.A. students who have completed 3.0 credits in the program may select a co-op option. The co-op program provides opportunities to integrate the theoretical and practical aspects of international affairs.

The 0.0 credit co-op is in addition to the 5.0 credits required for the M.A., and a minimum of two co-op terms must be successfully completed before the student is eligible to receive a co-op designation on their academic transcript. Students register in one of the co-op courses (INAF 5911, INAF 5912 or INAF 5913) and are restricted from taking more than 0.5 credit at the same time.

Work terms are four months in duration, and typically students are employed at the junior officer level in government departments or other organizations. Information and procedures can be obtained from the Carleton University Co-op Office.

#### Program Requirements - Part-time M.A.

In some cases, an applicant with relevant full-time employment experience may be admitted to a part-time M.A. program. While the program requirements are the same as those for full-time students, part-time students may take up to six calendar years from the date of initial registration to complete the program.

Part-time students must register for a minimum of one term in three, and must successfully complete INAF 5001: Policy and Methods for International Affairs [0.5 credit] by the end of the Winter term following the first Fall registration. In addition, the economics and compulsory cluster course requirements must be included in the first 2.5 credits completed.

Students enrolled in the full-time master's program may only request a transfer to the part-time program:

- once they have completed two terms of full-time study
- if they are employed 35 hours or more per week
- if they are medically unable to attend the program on a full-time basis

Students who elect to complete the program by a combination of full- and part-time study are governed by the following time limits: five calendar years if the candidate is registered full-time for two or three terms and part-time for the balance; four calendar years if the candidate is registered full-time for four or five terms and part-time for the balance.

### M.A. International Affairs/LL.B.

#### About the Program

The Norman Paterson School of International Affairs and the Common Law Section of the Faculty of Law at the University of Ottawa offer a joint Master of Arts in International Affairs and Bachelor of Laws degree (M.A./LL.B.). The benefit of the joint program is the integration of students, legal training and graduate studies in international affairs.

#### Admission Requirements

Please Note: Students must apply separately to the Faculty of Law, Common Law Section, at the University of Ottawa and to the Norman Paterson School of International Affairs, and be accepted by both institutions in accordance with the normal admission requirements of each program. Interest in pursuing the joint program must be specified in each application.

#### Program Requirements

A student will complete both the M.A. and the LL.B. programs over four calendar years.

Students will be expected to fulfil the normal requirements of both the M.A. and LL.B. programs.

In addition, students in the joint program will be required to complete courses in international law to be specified by the Faculty of Law.

Of the 5.0 credits completed for the M.A. degree, up to 1.5 credits may be applied to the Bachelor of Laws degree.

In undertaking the M.A./LL.B. research essay, students will be expected to integrate both components of the joint program into their work.

The normal sequence of courses for the two degrees is as follows:

#### First Year

Normal LL.B. first year (required course work to include a 0.5-credit course in international law)



**Second Year**

Normal M.A. first year (as described in full-time M.A. program requirements)

**Third and Fourth Year**

Students will make up any additional M.A. credit requirements. These could include an M.A./LL.B. research essay (INAF 5906) or M.A./LL.B. research thesis (INAF 5919). M.A./LLB research essays and theses will have at least one supervisor from NPSIA and one supervisor from the Law School.

**Ph.D. International Affairs**

**About the Program**

NPSIA's Ph.D. program is interdisciplinary and focuses on international policymaking processes and institutions. Its objective is to provide students with advanced training and research skills suitable for both an academic career, or for more senior policy analysis and research positions in government and non-governmental institutions.

**International Conflict Management and Resolution**

Interdisciplinary and policy-oriented research on international and intrastate conflict management and resolution. Sources of and responses to conflict, drawing from traditional and non-traditional frameworks with an emphasis on diagnostic and analytic skills. Topics include conflict management, peacekeeping, crisis decision-making, the management of terrorism, arms control, concepts of security, peace-building, and conflict prevention.

**International Development Policy**

Interdisciplinary and policy-oriented research on international development. Global, regional, community and institutional dimensions of development as a social, economic and political process. Topics include the linkages between development and trade, finance, regional integration, technology transfer and transnational enterprises, the environment and natural resources, health, education, labour, and institutions.

**International Economic Policy**

Interdisciplinary and policy-oriented research on the relationship between the global markets, civil society, and states. Theories and policy approaches to international political economy, drawn from economics, political science and other disciplines. Topics include trade, finance, multinational corporations, international migration, and a critical analysis of the issues surrounding the phenomenon of global integration.

**Academic Regulations**

See the General Regulations section of this Calendar.

To successfully complete the doctoral program, students must obtain a grade of B- or better in each course credit, and Satisfactory or Distinction in the field seminars, comprehensive examinations, doctoral research seminar, the research prospectus defence, and the Ph.D. thesis and its oral defence.

**Admission Requirements**

Admission into the Ph.D. program will be judged primarily on the applicant's ability to undertake research successfully and his/her prospects for completion of the program. Admission to the Ph.D. program is governed by the requirements stated in the General Regulations section of this Calendar.

The normal requirement for admission to the doctoral program in International Affairs is a Master's degree in a social science with at least an A- average.

Relevant work experience is also considered. Students who lack sufficient background at the graduate level in international affairs will be required to take supplementary courses extra to degree prior to admission.

Students with no formal training in economics must complete a 1.0 credit (or equivalent) course in introductory economics (introductory microeconomics and introductory macroeconomics for economics majors) plus at least 1.0 credit (or the equivalent) at the advanced undergraduate (typically third or fourth year) or intermediate theory level to be considered for admission.

Students who are admitted to the doctoral program but lack sufficient specialization in their fields of study may be required to take additional courses at the graduate level in preparation for their field seminars.

All applicants whose first language is not English will be required to obtain an overall score of 70 or over on the Canadian Academic English Language Assessment with a minimum score of 70 for the writing section or a TOEFL score of 250 computer-based, 100 iBT (minimum score of 25) in each of reading, writing, speaking and listening.

**Program Requirements**

The Ph.D. in International Affairs is a 10.0 credit program. The specific requirements are:

- A thesis [5.0 credits]
- Two field seminars [0.5 credit each] in the area of declared fields
- Two field comprehensive examinations [0.5 credit each] in the area of declared fields
- A doctoral research seminar [0.5 credit] which requires public defence of a research prospectus
- 1.5 credits of compulsory courses in research methods and policy analysis
- 1.0 credit (or the equivalent) of compulsory economics courses
- A demonstrated ability in a second language

**Detailed Program Requirements**

**Residence Requirement**

All Ph.D. candidates must be registered full time for a minimum of six terms to satisfy the residence requirement.

**Courses**

The following 2.5 credits of compulsory courses must be completed within the first two years of initial registration.

- 0.5 credit in INAF 6001: Qualitative Research Methods
- 0.5 credit in INAF 6002: Quantitative Research Methods
- 0.5 credit in INAF 6003: Advanced International Policy Analysis
- An additional 1.0 credit (or the equivalent) selected from the economics courses offered by the School, related to the chosen comprehensive examination field and selected with permission of the Associate Director. Candidates with sufficient economics training may be permitted to substitute other courses.

Programs



**Field Seminars**

- Two field seminars (0.5 credits each) must be completed within the first two years of initial registration. At least one of these will be in a field offered by NSPIA faculty (INAF 6100, INAF 6200, INAF 6300). The field seminars provide a venue for doctoral students to explore the literature that serves as the foundation for the comprehensive examinations and some students may be advised to take additional courses.

**Field Comprehensives**

Two field comprehensives (0.5 credit each) must be completed with grade of Satisfactory or Distinction within the first two years of initial registration. Failure to complete this requirement within the time limit may result in withdrawal from the program.

The comprehensive examination is based on a set of readings provided at the beginning of the academic year (Fall term) and may be completed through a combination of self-directed study, M.A. courses, the Field Seminar and consultation with faculty members. A candidate whose performance is not satisfactory may, at the discretion of the examining board, be required to submit to either an oral or written examination.

Students may, with the School's permission, apply to complete a field and an associated comprehensive examination in another discipline. The field must be in a discipline related to the student's program of study, and requires the approval of the host department. The student is required to fulfil all of the host department's requirements for the equivalence of a field designation, including any course work and the associated comprehensive examination.

**Doctoral Research Seminar**

A seminar where research issues are discussed. Satisfactory completion of the seminar requires the successful public defence of a research prospectus that will be the basis for the dissertation.

**Thesis (5.0 credits)**

All Ph.D. candidates are required to successfully complete and defend a thesis equivalent to 5.0 credits on a topic approved by the School.

**Language Requirement**

All students must demonstrate an ability to read academic material in a language other than English sufficient to conduct doctoral research in international affairs. This requirement will be fulfilled before the defence of the research prospectus. To fulfil the language requirement, a student must pass a written examination administered by the School, or meet the equivalent standard as determined by the School.

## Journalism

School of Journalism and Communication  
 St. Patrick's Building 346  
 Tel.: 613-520-7404  
 carleton.ca/sjc

- M.Journalism

### M. Journalism

#### About the Program

The emphasis in the 10.0-credit M.J. program is on advanced professional education and related coursework for those who are or intend to become practising journalists in the news media. In practical terms, this entails both the polishing of professional journalistic skills to a high level of proficiency and advanced education in a related field of study. In their second year of study, students will choose one of three fields of concentration:

- Specialized Print Reporting
- Broadcast Journalism
- Online Journalism

There is also a five-credit M.J. program for those with a B.J. (Honours) or equivalent or at least five years of professional experience in journalism. There are no fields of concentration in this program.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

Most applicants will be admitted to the First year of a two-year course of study, but some may qualify for admission directly to the five-credit program (see below). An admissions committee, including the supervisor of graduate studies, will determine the admissions qualifications of each applicant.

A student who holds a bachelor's or master's degree from a recognized university in a field other than journalism may be admitted to the first year of study if he or she achieved at least high honours standing.

International students whose first language is not English need TOEFL scores of at least 250 CBT or 600, IELTS scores of at least 7 in all components, or CAEL Assessment scores of at least 70, or acceptable certification that the language of instruction in their most recently completed undergraduate or graduate degree was English. Such students who complete the core first year, outlined below, and meet the requirements of the Faculty of Graduate Studies and Research, Section 11 of the General Regulations section of this Calendar, may proceed to second year.

A limited number of spaces will be made available for direct admission to the five-credit M.J. program. Students must normally possess one of the following qualifications to be considered for this advanced admission:

- a B.J. (Honours) or the equivalent with high second-class standing, or a degree in another discipline from a recognized university plus at least five years of professional experience in journalism, or long and distinguished professional experience in journalism.
- Students with suitable professional qualifications but no degree may occasionally be admitted to a program in which they take a required number of undergraduate courses in addition to the M.J. program.

Admission will be selective. Admission will not be guaranteed to all who meet the published minimum requirements, as there are many more qualified applicants each year than there are available spaces.

Applicants who have a three-year journalism degree with high honours standing may be admitted to a first year made up largely of approved courses from the Faculties of Arts and Social Sciences and Public Affairs. Such students may proceed to the second year of study if they have achieved high honours standing.

#### Program Requirements

##### First Year

Candidates admitted to the first year of the Master of Journalism program must complete the following courses before proceeding to the second year of study:

- JOUR 5000, JOUR 5200, JOUR 5202, JOUR 5206, JOUR 5401, JOUR 5706
- 1.0 credit of approved electives

First year M.J. candidates may be considered for advanced standing in certain of the above-required courses, but in such cases will be required to replace waived courses with approved options.

##### Second Year

Credits will be determined according to the stream pursued:

##### Specialized Print Reporting

- JOUR 5208, JOUR 5700, JOUR 5704, JOUR 5705, JOUR 5908
- 1.5 credits of approved electives in the student's area of specialization

Note: under special circumstances, and with the School's approval, a student could replace JOUR 5706, 5908 and 0.5 credit of approved electives above with a 2.0 credit M.J. Thesis, JOUR 5909.

##### Broadcast Journalism

- JOUR 5208, JOUR 5702, JOUR 5707, JOUR 5708, JOUR 5908
- 1.5 credits of approved electives in the student's area of specialization.

##### Note:

Under special circumstances, and with the School's approval, a student could replace JOUR 5706, 5908 and 0.5 credit approved electives above with a 2.0-credit thesis, JOUR 5909.

##### Online Journalism

- JOUR 5208, JOUR 5508, JOUR 5700, JOUR 5705
- one of JOUR 5704, JOUR 5707 or JOUR 5708
- JOUR 5908
- 1.0 credit of approved electives in the student's area of specialization.

Note: Under special circumstances, and with the School's approval, a student could replace JOUR 5705, 5908 and 0.5 credit approved electives above with a 2.0-credit thesis, JOUR 5909.

#### Five-credit M.J. program

##### Journalism Studies

- JOUR 5000 (if admitted directly to second year). Students admitted to the two-year program and completing a thesis as outlined in the Note above will complete JOUR 5000 in the first year of

studies and an approved replacement option for an additional Journalism first year half credit

- JOUR 5500, JOUR 5909
- 2.0 elective credits related to the study of the media, chosen in consultation with the Supervisor of Graduate Studies.

**Note:**

As a condition for graduation, all students are required to have a minimum of four months of practical experience in the media, and a working knowledge of a second language, preferably French.

## Legal Studies

Department of Law  
Loeb Building C473  
Tel.: 613-520-3690  
carleton.ca/law

- Certificate in Conflict Resolution (listed under Conflict Resolution)
- M.A. Legal Studies

### M.A. Legal Studies

#### About the Program

The M.A. program provides an interdisciplinary, theoretical, and research-oriented approach to studying law as a social and political institution, with emphasis on the relationship between law and social transformation. The plan of studies includes a range of fields linked by a common theoretical and methodological concern with the way law shapes and is shaped by its social environment. The program is designed to develop the conceptual and analytical skills required for conducting independent research on law and society.

The research and teaching interests of faculty members in the Department include the following areas of specialization:

- Crime, Governance and Security
- Globalization, International Law and Transnational Justice
- Citizenship, Human Rights and Political Economy
- Gender, Sexuality and Identity
- Law, History, Culture and Humanities
- Conflict Resolution

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The requirement for admission into the M.A. program in Legal Studies is an Honours bachelor's degree or the equivalent, with at least high honours standing.

Applicants will be considered for admission on the basis of their academic background and standing. Where relevant, previous professional experience may be taken into account.

The Supervisor of Graduate Studies may, in some circumstances, recommend that applicants with exceptional promise who have less than BA (Honours) status be admitted into a qualifying-year program designed to raise their standing to honours status.

Applicants without a background in law may be required to complete one or more designated courses from the department's undergraduate program before taking courses towards the master's degree.

Application deadlines can be found at:  
<https://gsapplications.carleton.ca/>

#### Program Requirements

In consultation with the supervisor of graduate studies, each candidate is required to complete one of the following programs of studies:

- 3.0 credits and a 2.0-credit thesis (LAWS 5909), which includes an oral examination.
- 4.0 credits and a 1.0-credit research essay (LAWS 5908)

- All students are required to take LAWS 5000 and LAWS 5001. These courses provide students with a common theoretical and interdisciplinary framework for the program.
- In addition, students are encouraged to take 0.5 credit in a related discipline, in consultation with the supervisor of graduate studies.
- All students must obtain satisfactory grades in their course work; make satisfactory progress in their research; maintain a close working relationship with their thesis or research essay supervisors; and attend seminars on current research and related topics.

#### Thesis/Research Essay

The thesis or research essay must represent the result of the candidate's independent research undertaken after being admitted into graduate studies in the Department of Law. Previous work of the candidate may be used only as introductory or background material for the thesis or research essay.

A student may carry on research work related to the thesis or research essay off campus if the work is approved in advance and supervision arrangements have been made with the supervisor of graduate studies.

#### Guidelines for Completion of Master's Degree

Full-time students are expected to complete the required two courses, LAWS 5000 and LAWS 5001, and either an additional 2.0 credits (for those following the thesis program), or an additional 3.0 credits (for those following the research essay program) by the end of the second term of registration. The thesis or research essay should normally be submitted by the end of the fourth term of study.

Part-time students are expected to complete the required two courses, LAWS 5000 and LAWS 5001, and either an additional 2.0 credits (for those following the thesis program) or an additional 3.0 credits (for those following the research essay program) by the end of their third year of study. The thesis or research essay should normally be submitted by the end of the fifth year of study.

#### Selection of Courses in Related Disciplines

In addition to the graduate courses offered by the Department of Law, students in the M.A. program are encouraged to take at least 0.5 credit in a related discipline, in consultation with the supervisor of graduate studies.

Students can propose taking a graduate level course from any department in the University but the following disciplines tend to provide courses of particular interest to Legal Studies students: Canadian Studies, Economics, Geography, History, International Affairs, Journalism and Communication, Political Science, Psychology, Public Administration, Sociology and Anthropology, Social Work.

### Ph.D. Legal Studies

#### About the Program

The Department of Law is uniquely representative of, and committed to, the diverse and polyvocal traditions that link social, political and legal theory into the discipline of Legal Studies. Its commitment to theoretical, methodological and conceptual diversity and to productive engagement across traditions is a distinct strength of our faculty and we seek to encourage a broad theoretical competency and engagement in our graduate students. Within this commitment to a diverse and broad program



of study, doctoral students also select one field of concentration from the following three:

#### **Crime, Law and Security**

This field explores historical and contemporary debates around the social, political, economic and cultural contingencies of crime and security as mediated through law. Both the state and civil society's responses are analyzed in the context of discourses and representations of crime and its control, governmental rationalities and crime control strategies, regulatory regimes, public and private surveillance, and both state and non-state acts of violence and coercion.

#### **Human Rights, Citizenship and Global Justice**

This field focuses on the ways law has been implicated in the social, political and economic transformations wrought by globalization, and the constitutive relation between these processes and human rights, citizenship, and global justice. It questions citizenship as traditionally conceptualized as the rights and obligations attached to membership in the nation-state in relation to the changing contours of law, sovereignty and democracy under globalizing conditions and the "War on Terror".

#### **Law, Regulation and Governance**

This field focuses on the historical and contemporary place of law and regulation in the processes, discourses, knowledges and practices of governance. Emphasis is placed on investigating law and state as distinct sources of regulation, while examining wider forms of domestic and global governance. Particular focus is placed on the diversity of law-governance relationships both within and between regulatory regimes.

#### **Academic Regulations**

See the General Regulations section of this Calendar.

Note: Doctoral students must normally obtain a grade of B- or better in each course counted toward the fulfillment of the requirements of the degree.

#### **Admission Requirements**

Applicants will normally hold a master's degree (or equivalent) with at least an A- average. Given the interdisciplinary nature of the department and the graduate program, applications are accepted from a wide variety of backgrounds, including, but not limited to, legal studies, political science, history, criminology, sociology, women's studies and philosophy. In cases of uncertainty, potential applicants are encouraged to contact the Graduate Supervisor as to the suitability of their background. Depending on their academic background, applicants may be asked to complete course work in addition to the Ph.D. program requirements.

#### **Program Requirements**

Students admitted to the Ph.D. program are bound by the General Regulations of the Faculty of Graduate Studies and Research, and are required to complete a total of 10.0 credits as follows:

- 0.5 credit in LAWS 6000 Doctoral Seminar in Legal Studies
- 0.5 credit in LAWS 6001 Proseminar in Legal Studies
- 1.0 credit in LAWS 6095 Field Comprehensive LAWS 6096 Thesis Proposal
- 1.5 credits in approved courses, at least 0.5 of which must be chosen from LAWS 6002, LAWS 6003, or LAWS 6004. Students will normally be required to take the course which relates to their field of study. Optional courses will be selected from a list approved annually by the department. Students may complete up to 1.0 credit of

approved courses offered in other departments. Students may also choose directed reading courses with the core faculty of the program.

- Language requirements as noted below.
- 5.5 credits in LAWS 6909 Ph.D. Thesis

#### **Comprehensive Examination and Thesis Proposal**

As indicated above, each doctoral candidate must successfully write and pass a field comprehensive examination (LAWS 6095). The examination will focus on the relevant theoretical and methodological issues related to the candidate's field of study:

1. Crime, Law and Security
2. Human Rights, Citizenship and Global Justice
3. Law, Regulation and Governance

The examination can take a variety of forms including, for example, a major paper, a take-home examination, or a course design, each of which may be required to be defended at an oral examination. The exact format of the comprehensive examination is at the discretion of the student's supervisory committee in consultation with the student. This committee will also form the examining board of the comprehensive examination. Evaluation is on the basis of Pass with Distinction/Pass/Fail. LAWS 6095 will normally be completed no later than the end of the fall of the second year of registration in the program. Failure to complete the examination successfully will result in denial of permission to continue in the program.

Also as indicated above, each doctoral candidate must successfully complete and defend a thesis proposal (LAWS 6096). The proposal must be written after the completion of the other course requirements, and normally should be completed by the end of the second year of doctoral study. The proposal is defended at an oral examination conducted by the supervisory committee. Evaluation is on the basis: Pass/Fail. The proposal must be successfully defended before the candidate can register in the Ph.D. Thesis (LAWS 6909).

#### **Thesis**

The Ph.D. thesis must be successfully defended at an oral examination.

#### **Language Requirements**

Candidates must demonstrate reading ability in an approved language, other than English, normally by successfully completing a translation examination during the second year of full-time enrolment in the program.

#### **Period of Study**

This program is designed to be completed in four years of full-time study. Students admitted to part-time study will normally complete all requirements within eight years of registration.

#### **Selection of Courses in Related Disciplines**

In addition to the graduate courses offered by the Department of Law, students in the Ph.D. program are permitted to take up to 1.0 credit of courses in a related discipline, in consultation with the Graduate Supervisor.

Students should be aware that the number of spaces in graduate courses offered by other departments may be limited, and that registration may be conditional upon obtaining the prior approval of the department concerned. It is the student's responsibility to ensure that permission is obtained from the appropriate department prior to registering in any of the department's courses.

Programs - Legal Studies

For an up-to-date listing of offerings and course descriptions in other departments, please consult the graduate calendar and the class schedule at <https://central.carleton.ca>.

# Mathematics

School of Mathematics and Statistics  
 HP 4302  
 Tel: 613-520-2155  
 mathstat.carleton.ca

- M.Sc. Mathematics (Applied Mathematics, Probability and Statistics, Pure Mathematics)
- M.Sc. Mathematics with Specialization in Bioinformatics (Specialization requirements listed under Bioinformatics)
- M.Sc. Mathematics with Specialization in Biostatistics (Collaborative Program) (Specialization requirements listed under Biostatistics)
- M.Sc. Information and Systems Science (Mathematics) (Listed under Information and Systems Science)
- Ph.D. Mathematics (Applied Mathematics, Probability and Statistics, Pure Mathematics)

## M.Sc. Mathematics

### About the Program

Students pursuing studies in pure mathematics, applied mathematics, probability and statistics at the graduate level leading to an M.Sc. or a Ph.D. do so in a joint program offered by the School of Mathematics and Statistics at Carleton University and the Department of Mathematics and Statistics at the University of Ottawa under the auspices of the Ottawa-Carleton Institute of Mathematics and Statistics. The Institute is responsible for supervising the programs, regulations, and student admissions, and for providing a framework for interaction between the two departments at the research level.

### Academic Regulations

See the General Regulations section of this Calendar.

### Admission Requirements

The normal requirement for admission to the master's program is an Honours bachelor's degree in mathematics, or the equivalent, with at least high honours standing.

Applicants holding a general (three-year) degree with at least high honours standing may be admitted to a qualifying-year program.

Subsequent admission to the regular master's program depends on performance during the qualifying-year program and will be decided no later than one year after admission to the qualifying-year program. Details are outlined in the General Regulations section of this Calendar.

### Program Requirements

The three options for the M.Sc. program are:

- 2.0 credits and a thesis, or
- 3.0 credits and a research project, or
- 4.0 credits

### Notes:

1. A maximum of 1.0 credit of undergraduate courses at the 4000-level may be taken to satisfy these requirements.
2. Students should consult their supervisors regarding their course selection to ensure that not all courses taken are in the same field of mathematics; at least 1.0 credit should be in another field.
3. All master's students are encouraged to participate in a seminar or project under the guidance of their supervisors.

4. A maximum of 1.0 credit taken outside of the School of Mathematics and Statistics at Carleton University or the Department of Mathematics and Statistics at the University of Ottawa may be allowed for credit, subject to the approval of the School.
5. Students who plan to specialize in probability or statistics are strongly advised that during their master's program they include, where possible, the courses STAT 5600, STAT 5501 in mathematical statistics, STAT 4502, STAT 5505 in applied statistics, and STAT 4501, STAT 5701 in probability. In addition, a graduate course in another field, such as biology, biostatistics, economics, computer science, systems analysis, and stochastic modeling, is highly recommended.

### Course Selection

The following undergraduate courses may, with the approval of the School of Mathematics and Statistics, be selected by master's candidates in partial fulfillment of their degree requirements. Students should consult their supervisors regarding course selection to ensure that not all courses taken are in the same field of mathematics; at least 1.0 credit should be in another field.

#### Mathematics and Statistics

MATH 4002	Fourier Analysis
MATH 4105	Rings and Modules
MATH 4107	Commutative Algebra
MATH 4109	Fields and Coding Theory
MATH 4207	Foundations of Geometry
MATH 4208	Introduction to Differentiable Manifolds
MATH 4700	Partial Differential Equations
MATH 4703	Qualitative Theory of Ordinary Differential Equations
MATH 4801	Topics in Combinatorics
MATH 4802	Introduction to Mathematical Logic
MATH 4803	Topics in Applied Logic
MATH 4806	Numerical Analysis
MATH 4808	Graph Theory and Algorithms
MATH 4811	Combinatorial Design Theory
STAT 4501	Probability Theory
STAT 4502	Sampling: Theory and Methods
STAT 4504	Statistical Design and Analysis of Experiments
STAT 4601	Data Mining 1
STAT 4603	Time Series and Forecasting
STAT 4604	Statistical Computing
STAT 4605	Statistical Methods in Biostatistics
STAT 4606	Practices in Biostatistics

## Ph.D. Mathematics

### About the Program

Students pursuing studies in pure mathematics, applied mathematics, probability and statistics at the graduate level leading to an M.Sc. or a Ph.D. do so in a joint program offered by the School of Mathematics and Statistics at Carleton University and the Department of Mathematics and Statistics at the University of Ottawa under the auspices of the Ottawa-Carleton Institute of Mathematics and Statistics. The Institute is responsible for supervising the programs, regulations, and student admissions, and for providing a framework for interaction between the two departments at the research level.

### Academic Regulations

See the General Regulations section of this Calendar.

### Admission Requirements

The normal requirement for admission to the Ph.D. program is a master's degree in mathematics, or the equivalent, with at least B+ standing. Details are outlined in the General Regulations section of this Calendar.

### Program Requirements

Course requirements include a minimum of 3.0 credits and a suitable thesis.

Not all of these courses may be taken in the same field of mathematics; at least 1.0 credit must be in another field.

All candidates must take comprehensive examinations.

All candidates must satisfy a language requirement. The language requirement is determined by the candidate's advisory committee and normally requires the ability to read mathematical literature in a language considered useful for his/her research or career, and other than the candidate's principal language of study.

Students specializing in mathematics or probability undertake a comprehensive examination in the following areas:

- The candidate's general area of specialization at the Ph.D. level
- Examinations on two topics chosen from applied analysis, discrete applied mathematics, algebra, analysis, probability, topology, and statistics.

Students specializing in statistics must write an examination in the following areas:

- Mathematical statistics which includes multivariate analysis
- An examination in probability, and
- An examination in either (i) applied statistics, or (ii) analysis

In all cases, the examination must be completed successfully within twenty months of initial registration in the Ph.D. program in the case of full-time students, and within thirty-eight months of initial registration in the case of part-time students.

All Ph.D. candidates are also required to undertake a final oral examination on the subject of their thesis.



## Mechanical and Aerospace Engineering

Ottawa-Carleton Institute for Mechanical and Aerospace Engineering  
 Carleton University  
 Minto 3090  
 Tel.: 613-520-5659  
 ocimae.ca

- M.A.Sc. Aerospace Engineering
- M.A.Sc. Materials Engineering
- M.A.Sc. Mechanical Engineering
- M.Eng. Aerospace Engineering
- M. Eng. Materials Engineering
- M.Eng. Mechanical Engineering
- Ph.D. Aerospace Engineering
- Ph.D. Mechanical Engineering

### M.A.Sc. (Aerospace, Materials, Mechanical Engineering), M.Eng. (Materials, Mechanical Engineering)

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission to the master's program is a bachelor's degree with at least high honours standing in mechanical or aerospace engineering or a related discipline.

#### Program Requirements

##### M.A.Sc. - Master's by Thesis

The requirements for course work are specified in terms of credits: one credit is one hour/week for one term (thirteen weeks). The requirements for the master's are:

- 2.5 course credits
- Participation in the Mechanical and Aerospace Engineering seminar series
- Thesis
- Students are expected to complete the master's program within the maximum limits outlined in the Section 13.2 of the General Regulations section of this Calendar.

##### M.Eng. - Master's by Course Work

The requirements for the master's degree by course work are either:

- 3.5 course credits plus a project equivalent to 1.5 course credits (MECH 5908 for Carleton University students; MCG 6000 for University of Ottawa students); or
- 5.0 course credits.

Students are expected to complete the master's program within the maximum limits outlined in the Section 13.2 of the General Regulations section of this Calendar.

## Ph.D. Aerospace Engineering Ph.D. Mechanical Engineering

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission to the Ph.D. program is a master's degree in mechanical or aerospace engineering or a related discipline.

Students who have been admitted to the master's program may be permitted to transfer into the Ph.D. program if they show outstanding academic performance and demonstrate significant promise for advanced research.

In addition, graduate courses offered by departments in other disciplines may be taken for credit with approval by the department in which the student is registered.

#### Program Requirements

The requirements for the Ph.D. degree (from the master's degree) are:

1. 1.5 course credits
2. Participation in the Mechanical and Aerospace Engineering seminar series.
3. Successful completion of the comprehensive examination according to section 18.11 of the General Regulations section of this Calendar.
4. Thesis. The examining board for all theses will include professors from both departments and an external examiner who is a member of neither university.
5. Students who have been permitted to transfer into the Ph.D. program from a master's program require 4.5 course credits for the Ph.D.

#### Graduate Courses

Not all of the following courses are offered in a given year. Consult the Ottawa-Carleton Joint Institute for Mechanical and Aerospace Engineering (OCIMAE) website for course offerings.

The following codes identify the department offering the course: 'MECH' Department of Mechanical and Aerospace Engineering, Carleton University, 'MAAJ' Department of Mechanical Engineering, University of Ottawa.

##### Carleton University

MECH 5000 (MCG 5300)	Fundamentals of Fluid Dynamics
MECH 5001 (MCG 5301)	Theory of Viscous Flows
MECH 5003 (MCG 5303)	Incompressible Non-Viscous Flow
MECH 5004 (MCG 5304)	Compressible Non-Viscous Flow
MECH 5008 (MCG 5308)	Experimental Methods in Fluid Mechanics
MECH 5009 (MCG 5309)	Environmental Fluid Mechanics Relating to Energy Utilization
MECH 5100 (MCG 5310)	Performance and Economics of Aircraft

Programs - Mechanical and Aerospace Engineering

MECH 5101 (MCG 5311) Dynamics and Aerodynamics of Flight  
 MECH 5104 (MCG 5314) Ground Transportation Systems and Vehicles  
 MECH 5105 (MCG 5315) Orbital Mechanics and Space Control  
 MECH 5106 (MCG 5121) Space Mission Analysis and Design  
 MECH 5107 (MCG 5317) Experimental Stress Analysis  
 MECH 5201 (MCG 5321) Methods of Energy Conversion  
 MECH 5202 (MCG 5122) Smart Structures  
 MECH 5300 (MCG 5330) Engineering Acoustics  
 MECH 5301 (MCG 5331) Aeroacoustics  
 MECH 5302 (MCG 5332) Instrumentation Techniques  
 MECH 5304 (MCG 5334) Computational Fluid Dynamics of Compressible Flows  
 MECH 5400 (MCG 5344) Gas Turbine Combustion  
 MECH 5401 (MCG 5341) Turbomachinery  
 MECH 5402 (MCG 5342) Gas Turbines  
 MECH 5403 (MCG 5343) Advanced Thermodynamics  
 MECH 5407 (MCG 5347) Conductive and Radiative Heat Transfer  
 MECH 5408 (MCG 5348) Convective Heat and Mass Transfer  
 MECH 5500 (MCG 5350) Advanced Vibration Analysis  
 MECH 5501 (MCG 5125) Advanced Dynamics  
 MECH 5502 (MCG 5352) Optimal Control Systems  
 MECH 5503 (MCG 5353) Robotics  
 MECH 5504 (MCG 5354) Guidance, Navigation and Control  
 MECH 5505 (MCG 5355) Stability Theory and Applications  
 MECH 5506 (MCG 5356) Neuro and Fuzzy Control  
 MECH 5507 (MCG 5124) Advanced Kinematics  
 MECH 5601 (MCG 5361) Creative Problem Solving and Design  
 MECH 5602 (MCG 5362) Failure Prevention (Fracture Mechanics and Fatigue)  
 MECH 5603 (MCG 5381) Lightweight Structures  
 MECH 5604 (MCG 5364) Computational Metallurgy  
 MECH 5605 (MCG 5365) Finite Element Analysis I  
 MECH 5606 (MCG 5366) Finite Element Analysis II  
 MECH 5607 (MCG 5367) The Boundary Element Method (BEM)  
 MECH 5609 (MCG 5123) Microstructure and Properties of Materials  
 MECH 5700 (MCG 5345) Surfaces and Coatings  
 MECH 5701 (MCG 5369) Metallic Phases & Transformations

MECH 5704 (MCG 5374) Integrated Manufacturing Systems (CIMS)  
 MECH 5705 (MCG 5375) CAD/CAM  
 MECH 5800 (MCG 5480) Special Topics in Mechanical and Aerospace Engineering  
 MECH 5801 (MCG 5489) Special Topics in Mechanical Engineering and Aerospace  
 MECH 5802 (MCG 5483) Special Topics in Mechanical and Aerospace Engineering  
 MECH 5803 (MCG 5488) Special Topics in Mechanical and Aerospace Engineering  
 MECH 5804 (MCG 5384) Special Topics in Mechanical and Aerospace Engineering  
 MECH 5805 (MCG 5482) Special Topics in Mechanical and Aerospace Engineering  
 MECH 5806 (MCG 5486) Special Topics in Mechanical and Aerospace Engineering  
 MECH 5807 (MCG 5387) Special Topics in Mechanical and Aerospace Engineering  
 MECH 5808 (MCG 5376) Special Topics in Mechanical and Aerospace Engineering  
 MECH 5809 (MCG 5382) Special Topics in Mechanical and Aerospace Engineering

**University of Ottawa**

MAAJ 5001 (MCG 5101) Theory of Elasticity  
 MAAJ 5002 (MCG 5102) Advanced Stress Analysis  
 MAAJ 5003 (MCG 5103) Theory of Perfectly Plastic Solids  
 MAAJ 5004 (MCG 5104) Theory of Plates and Shells  
 MAAJ 5005 (MCG 5105) Continuum Mechanics  
 MAAJ 5006 (MCG 5106) Advanced Topics in Elasticity  
 MAAJ 5007 (MCG 5107) Advanced Dynamics with Applications  
 MAAJ 5008 (MCG 5108) Finite Element Analysis  
 MAAJ 5009 (MCG 5109) Advanced Topics in Finite Element Analysis  
 MAAJ 5100 (MCG 5110) Micromechanics of Solids  
 MAAJ 5101 (MCG 5111) Gas Dynamics  
 MAAJ 5104 (MCG 5114) Analysis and Design of Pressure Vessels  
 MAAJ 5015 (MCG 5115) Non-Linear Optimization

MAAJ 5107 (MCG 5117)	Introduction to Composite Materials	MAAJ 5708 (MCG 5178)	Advanced Topics in CAD/CAM
MAAJ 5108 (MCG 5118)	Introduction to Plasticity	MAAJ 5709 (MCG 5179)	Manufacturing System Analysis
MAAJ 5109 (MCG 5119)	Fracture Mechanics	MAAJ 5800 (MCG 5180)	Fibre Composite Materials II
MAAJ 5206 (MCG 5126)	Deformation of Materials	MAAJ 5801 (MCG 5181)	Advanced Vibrations
MAAJ 5209 (MCG 5129)	Hot Working of Metals	MAAJ 5802 (MCG 5182)	Theory of Elastic Instability
MAAJ 5301 (MCG 5131)	Heat Transfer by Conduction	MAAJ 5804 (MCG 5184)	Mechatronics
MAAJ 5302 (MCG 5132)	Heat Transfer by Convection	MAAJ 5805 (MCG 5185)	Multivariable Digital Control
MAAJ 5303 (MCG 5133)	Heat Transfer by Radiation	MAAJ 5806 (MCG 5186)	Non-Linear Discontinuous Dynamics and Control
MAAJ 5304 (MCG 5134)	Heat Transfer by Phase Change	MAAJ 5901 (MCG 5191)	Combustion in Premixed Systems
MAAJ 5306 (MCG 5136)	Special Studies in Fluid Mechanics and Heat Transfer	MAAJ 5902 (MCG 5192)	Combustion in Diffusion Systems
MAAJ 5307 (MCG 5137)	Special Studies in Solid Mechanics and Materials		
MAAJ 5308 (MCG 5138)	Advanced Topics in Mechanical Engineering		
MAAJ 5401 (MCG 5141)	Statistical Thermodynamics		
MAAJ 5408 (MCG 5551)	Théorie d'Écoulement Visqueux		
MAAJ 5409 (MCG 5552)	Théorie de Turbulence		
MAAJ 5500 (MCG 5557)	Méthodes Numériques en Mécaniques des Fluides		
MAAJ 5501 (MCG 5151)	Laminar Flow Theory		
MAAJ 5502 (MCG 5152)	Theory of Turbulence		
MAAJ 5505 (MCG 5155)	Inviscid Flow Theory		
MAAJ 5506 (MCG 5156)	Measurement in Fluid Mechanics		
MAAJ 5507 (MCG 5157)	Numerical Computation of Fluid Dynamics and Heat Transfer		
MAAJ 5508 (MCG 5158)	Industrial Fluid Mechanics		
MAAJ 5509 (MCG 5159)	Advanced Production Planning and Control		
MAAJ 5601 (MCG 5161)	Environmental Engineering		
MAAJ 5608 (MCG 5168)	Industrial Organization		
MAAJ 5609 (MCG 5169)	Advanced Topics in Reliability Engineering		
MAAJ 5700 (MCG 5170)	CAD/CAM		
MAAJ 5701 (MCG 5171)	Applied Reliability Theory		
MAAJ 5702 (MCG 5172)	Introduction to Management of Automation (Robotics and Numerical Control)		
MAAJ 5703 (MCG 5173)	Systems Engineering and Integration		
MAAJ 5706 (MCG 5176)	Industrial Control Systems		
MAAJ 5707 (MCG 5177)	Robot Mechanics		

## Music and Culture

School for Studies in Art and Culture: Music

St. Patrick's Bldg. 423

Tel.: 613-520-2342

carleton.ca/music

- M.A. Music and Culture

### M.A. Music and Culture

#### About the Program

The M.A. Music and Culture is designed to offer students a thorough grounding in new, interdisciplinary approaches to musicology. The primary objective is to offer students a forum where new perspectives in musicology can be explored in a critical and integrated manner. This exploration will be grounded in the specifics of music but conducted from within a range of theoretical approaches including (but not restricted to) sociology, linguistics, critical theory, feminism, cultural studies, historiography, music perception/cognition, music philosophy/aesthetics, music and politics, reception theory, media studies, performance studies, and ethnomusicology.

#### Academic Regulations

See the General Regulations section of this Calendar.

A standing of B- or better must be obtained in each course counted towards the Master's degree.

#### Admission Requirements

The minimum requirement for admission to the Master's program in Music and Culture is either a B.Mus. degree or a B.A. Honours degree in Music with a minimum B+ average.

Applicants with a B.A. Honours in a related discipline (e.g., Mass Communication, Women's Studies, Philosophy, or Cultural Studies), with a minimum average of B+, will also be considered provided the applicant can demonstrate a strong background in some form of music.

Applicants without the requisite background in either cultural/theory or music may be required to take a maximum of two full credits from designated courses at the undergraduate level in addition to their normal M.A. program requirements.

There are no performance requirements for admission to this degree program.

Applicants without a B.Mus. or B.A. Honours degree in Music, or a related discipline, but who have a three-year degree with a minimum average of B+, may be admitted to a qualifying year program. Students who complete the qualifying year requirements with a minimum average of B+ will be considered for admission to the Master's program.

#### Program Requirements

The Master's degree in Music and Culture requires the satisfactory completion of a total of 5.0 credits, distributed according to one of the following two options (students are required to choose one option over the other by March 1 of the first year of study):

##### Thesis Program

- 1.5 credits required course work (MUSI 5000, MUSI 5002 and MUSI 5004)
- 1.5 credits additional course work chosen from available elective courses
- 2.0 credits, Thesis

##### Research Essay Program

- 1.5 credits required course work (MUSI 5000, MUSI 5002 and MUSI 5004)
- 2.5 credits of additional course work chosen from available elective courses
- 1.0 credit, Research Essay

Subject to the approval of the graduate supervisor, 0.5 credit may be taken outside the program in a related discipline (such as Philosophy, Women's Studies, etc.)

##### Deadlines

###### Thesis Proposal

Full-time students normally will submit their thesis (or research essay) topic to the thesis proposal board no later than April 30 of the first year of registration for students enrolled full-time, and no later than the middle of the fifth term of registration for students enrolled part-time.

Regulations governing requirements for the Master's thesis, including deadlines for submission, are outlined in the General Regulations section of this Calendar.

##### Language Requirements

Students are required to demonstrate a reading knowledge of French (or another language related to their research, to be approved by the Music and Culture graduate supervisor).



# Neuroscience

Department of Neuroscience  
325 Life Science Research Building  
613-520-4020  
carleton.ca/neuroscience

- M.Sc. Neuroscience
- Ph.D. Neuroscience

## M.Sc. Neuroscience

### About the Program

Neuroscience is a multidisciplinary field, encompassing different aspects of psychology, biology, chemistry, neurophysiology, genetics and epidemiology. Members of the Department of Neuroscience are engaged in a range of research topics examining the function of the central nervous system in both normal and disease states, using state-of-the-art facilities for microscopy, histology, neurochemistry, behavioural analysis, electrophysiology and molecular genetic analysis. Students will have the opportunity to learn these valuable techniques, and develop research projects aimed at the elucidation of many aspects of brain functioning and associated mental health diseases, including addiction, depression, Parkinson's disease, obesity, dementia and traumatic injury. As human behaviour is also an important area of study, there are laboratories in which to conduct human research related to the flourishing relationship between neuroscience and health psychology. Graduates of our program are well qualified to seek careers in the public sector, pharmaceutical research, and academia.

### Academic Regulations

See the General Regulations section of this Calendar.

### Admission Requirements

The minimum requirement for admission to the Master's program in Neuroscience is either a B.Sc. (Honours) in Neuroscience, Biology, or related field, or a B.A. (Honours) in Psychology. Applicants with other Bachelors honours degrees in related disciplines will also be considered provided the applicant can demonstrate a strong background that relates to Neuroscience.

Meeting the minimum requirements does not automatically guarantee acceptance into the program. In addition to transcripts and letters of reference, application packages must include a statement of interest.

### Program Requirements

The Master's degree in Neuroscience requires the satisfactory completion of 5.0 credits:

- 1.0 credit in NEUR 5100 Fundamentals in Neuroscience
- 0.5 credit in NEUR 5201 Statistics for Neuroscience I
- 0.5 credit in NEUR 5202 Statistics for Neuroscience II, or NEUR 5800 Special Topics in Neuroscience
- 3.0 credits in NEUR 5909 Thesis. Candidates must successfully complete a research thesis on a topic in Neuroscience supervised by a faculty member of the Department of Neuroscience.

**Fast Track Option:** Students who enroll in the M.Sc. program, and intend to subsequently continue into a Ph.D., will have the option of being fast-tracked into the Ph.D. program. Eligibility will be determined by

recommendation from the M.Sc. thesis committee, the Graduate Chair in Neuroscience, and the Dean of Graduate and Postdoctoral Affairs.

Regulations governing requirements for the Master's thesis, including deadlines for submission, are outlined in the General Regulations section of this Calendar.

## Ph.D. Neuroscience

### About the Program

Neuroscience is a multidisciplinary field, encompassing different aspects of psychology, biology, chemistry, neurophysiology, genetics and epidemiology. Members of the Department of Neuroscience are engaged in a range of research topics examining the function of the central nervous system in both normal and disease states, using state-of-the-art facilities for microscopy, histology, neurochemistry, behavioural analysis, electrophysiology and molecular genetic analysis. Students will have the opportunity to learn these valuable techniques, and develop research projects aimed at the elucidation of many aspects of brain functioning and associated mental health diseases, including addiction, depression, Parkinson's disease, obesity, dementia and traumatic injury. As human behaviour is also an important area of study, there are laboratories in which to conduct human research related to the flourishing relationship between neuroscience and health psychology. Graduates of our program are well qualified to seek careers in the public sector, pharmaceutical research, and academia.

### Academic Regulations

See the General Regulations section of this Calendar.

### Admission Requirements

An M.Sc. from an appropriate university is usually required for entry to the Ph.D. program.

A student already registered for the M.Sc. may be permitted to transfer to the Ph.D. program following a recommendation by the Departmental Graduate Committee.

Meeting the minimum requirements does not automatically guarantee acceptance into the program. In addition to transcripts and letters of reference, application packages must include a statement of interest.

### Program Requirements

The Ph.D. degree in Neuroscience requires the satisfactory completion of 10.0 credits:

#### Required courses:

- 1.0 credit in NEUR 6100 Advanced Seminar in Neuroscience
- 1.0 credit in the NEUR 6200 Comprehensive Examination
- 0.5 credit in NEUR 5201 Statistics for Neuroscience I (unless taken previously, in which case substitute with 0.5 credits of optional courses)
- 0.5 credit in NEUR 5202 Statistics for Neuroscience II (unless taken previously, in which case substitute with 0.5 credits of optional courses)
- 1.0 credit in optional courses (see list below)
- 6.0 credits in NEUR 6909 Thesis. Candidates must successfully complete a research thesis on a topic in Neuroscience supervised by a faculty member of the Department of Neuroscience.

Programs - Neuroscience

**Optional courses:**

Candidates may choose from the following list of optional courses:

- Up to 1.5 credits in NEUR 5800 Special Topics in Neuroscience
- Up to 1.0 credit in NEUR 6301 or NEUR 6302 Techniques in Neuroscience
- Up to 1.0 credit in NEUR 6401 or NEUR 6402 Independent Research in Neuroscience
- Up to 1.0 credit in NEUR 6501 or NEUR 6502 Directed Studies in Neuroscience

# Philosophy

Department of Philosophy  
 Paterson Hall 3A46  
 Tel.: 613-520-2110  
 carleton.ca/philosophy

- M.A. Philosophy

## M.A. Philosophy

### Academic Regulations

See the General Regulations section of this Calendar.

### Admission Requirements

The minimum requirement for admission to the master's program is an Honours B.A. degree (or the equivalent) in Philosophy, with at least B+ standing (or the equivalent).

Qualifying-year and M.A. applicants from an institution other than Carleton University must submit two papers.

### Qualifying Year

Applicants who do not hold an Honours degree (or the equivalent) will be required to register in a qualifying-year program before proceeding to the master's program. Regulations governing the qualifying year are outlined in the General Regulations section of this Calendar.

### Program Requirements

The specific program requirements for master's candidates are:

- 1.0 credit in PHIL 5850 Proseminar and PHIL 5900 Research Seminar;

### Thesis Option

- 2.0 credits in PHIL 5909 Thesis, which must be defended at an oral examination;
- 2.0 credits in courses, subject to the following limitations:
  - They may include PHIL 5700 or PHIL 5750 but not both;
  - They may include up to 1.0 credit from PHIL 5000, PHIL 5200, PHIL 5250, PHIL 5300, PHIL 5350, PHIL 5500, PHIL 5600, or, with permission of the department other approved courses at the graduate or 4000-level at Carleton or other universities;
  - They may include up to 1.0 credit in tutorials or, with permission of the department, approved graduate-only courses at the graduate level in other departments or at other universities;
  - They must include at least 0.5 credit in two of the following areas of study:
    - history of philosophy
    - philosophy of mind, philosophy of language, logic, epistemology, or metaphysics
    - moral, social, or political philosophy

### Research Essay Option:

- 1.0 credit in PHIL 5908 Research Essay;
- 1.0 credit from: PHIL 5700, PHIL 5750, or, with the permission of the department, approved graduate-level courses in other departments or at other universities;
- Up to 1.0 credit from PHIL 5000, PHIL 5200, PHIL 5250, PHIL 5300, PHIL 5350, PHIL 5500, and

PHIL 5600, or, with permission of the department, approved courses at graduate or 4000-level at Carleton or other universities;

- Up to 1.0 credit in tutorials, or, with permission of the department, approved graduate-level courses in other departments or at other universities;
- Courses chosen must include at least 0.5 credit in two of the following areas of study:
  - history of philosophy
  - philosophy of mind, philosophy of language, logic, epistemology, or metaphysics
  - moral, social, or political philosophy

### Guidelines for Completion of Master's Degree

Full-time students enrolled in the 5.0-credit M.A. program are expected to complete PHIL 5850, PHIL 5900, 2.0 further credits, and to submit the completed thesis or research essay approval form by the end of the second term of study. All full-time students are expected to submit the thesis or research essay by the end of the fourth term of study.

Part-time students enrolled in the 5.0 credit M.A. program are expected to complete PHIL 5850, PHIL 5900, 2.0 further credits, and to submit the completed thesis or research essay approval form by the end of the third year of study. All part-time students are expected to submit the thesis or research essay by the end of the fifth year of study.

### Course Selection

Not all courses are offered in a given year. For an up-to-date statement of course offerings and to determine the term of offering, consult the class schedule at central.carleton.ca. Full course descriptions can be found in the courses section of this Calendar.

### Special Topics

PHIL 5000 Special Topic in Philosophy

### Tutorials

PHIL 5004 Tutorial in the History of Philosophy I  
 PHIL 5005 Tutorial in the History of Philosophy II  
 PHIL 5104 Tutorial in the Work of an Individual Philosopher I  
 PHIL 5105 Tutorial in the Work of an Individual Philosopher II  
 PHIL 5204 Tutorial in Logic, Epistemology, or Metaphysics I  
 PHIL 5205 Tutorial in Logic, Epistemology, or Metaphysics II  
 PHIL 5304 Tutorial in Selected Problems of Philosophy I  
 PHIL 5305 Tutorial in Selected Problems of Philosophy II

### Colloquia

PHIL 5700 Fall Colloquium  
 PHIL 5750 Winter Colloquium

### Seminars

PHIL 5200 Topics in Philosophy of Mind or Philosophy of Language  
 PHIL 5250 Topics in Logic, Epistemology, Metaphysics or Philosophy of Science

Programs - Philosophy

PHIL 5300	Topics in Value Theory
PHIL 5350	Topics in Ethics or Political Philosophy
PHIL 5500	Topics in Contemporary Philosophy
PHIL 5600	Topics in the History of Philosophy
PHIL 5850	Proseminar
PHIL 5900	Research Seminar
PHIL 5908 [1.0]	Research Essay
PHIL 5909 [2.0]	M.A. Thesis



## Physics

Department of Physics  
3302 Herzberg Bldg.  
Tel.: 613-520-4320  
physics.carleton.ca

- M.Sc. Physics
- Ph.D. Physics
- M.A.Sc. Biomedical Engineering (listed under Biomedical Engineering)

### M.Sc. Physics

#### About the Program

The fields of graduate study in the Department of Physics at Carleton are particle physics and medical physics.

In the particle physics program, specialization can be in theoretical or in experimental particle physics.

In the medical physics program, specialization can be in imaging physics, cancer therapy physics, or medical biophysics. Research supervision can be on campus or be provided at health care institutions and government laboratories in the Ottawa region. The M.Sc. program leads to our CAMPEP-accredited Ph.D. program ([campep.org](http://campep.org))

The graduate program in physics is a joint program with the University of Ottawa as part of the Ottawa Carleton Institute for Physics (OCIP).

The fields of study offered by OCIP at the University of Ottawa are condensed matter physics, biological physics, and photonics.

Detailed information about our research program is available from the departmental website.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

An Honours B.Sc. in Physics or a closely related field at a standard acceptable to the two universities is normally required for admission to the M.Sc. program.

The admissions committee may require students to take an orientation examination during the first weeks of residence. The results of this examination may indicate the need for a student to register in undergraduate courses to fill gaps in his/her knowledge.

It is strongly recommended that all students have had at least one course in computing.

Candidates admitted to the M.Sc. program with more than the minimum course requirements may be permitted to credit towards the degree a maximum of 1.0 credit at the senior undergraduate level. This maximum does not apply to qualifying-year students.

#### Program Requirements

##### M.Sc. with Thesis:

- 2.5 credits of course work
- A thesis (2.5 credits) defended at an oral examination
- Participation in the seminar series of the Ottawa-Carleton Institute for Physics

Students with academic preparation particularly well suited for their chosen field of study may have their course credit requirements reduced to 2.0 credits. In this case, a 3.0-credit thesis will be required.

The minimum number of courses is 1.5 credits. At least 1.0 credit must consist of lecture courses at the graduate level. The courses PHYS 5900 and PHYS 5901 are courses on Selected Topics, normally given as directed studies, and cannot fulfil this lecture course requirement. Most students will be expected to take PHYS 5002, or another equivalent computing physics course. Students in experimental or theoretical particle physics streams will normally include PHYS 5601, PHYS 5602, PHYS 5701 and PHYS 5702 among their courses.

#### Medical Physics Stream

The three areas of specialization are: imaging, therapy, and biophysics. All students are required to take PHYS 5203 and 0.5 credit appropriate physics course from an area of physics other than medical physics. In addition:

- For imaging, PHYS 5204 is required
- For therapy, PHYS 5206 is required
- For biophysics, 0.5 credit chosen from PHYS 5207, cell biology, physiology or anatomy is required

Students with a medical/health physics background may have the selection of required courses adjusted to reflect their preparation and may receive advanced standing for equivalent courses.

A selection from PHYS 5208, PHYS 5209, or, (with approval) other appropriate courses in physics, engineering, computer science, business or law can be used to complete the program.

In special cases, the requirements may also be met by taking 5.0 credits of course work. 1.0 credit must be the selected topics course PHYS 5900.

#### Physics in modern technology stream:

- 3.0 credits of course work
- PHYS 5905
- Students will normally include two of PHYS 5002, PHYJ 5003, PHYJ 5004, PHYJ 5005 among their courses.

Students enrolled in the physics in modern technology stream are required to complete a work term rather than a research thesis. Students in this stream who wish to pursue a research degree should consult with the graduate supervisor. Although every effort is made to find a work term position for every student enrolled in the physics in modern technology stream, no guarantee of employment can be made. To minimize the likelihood of a work term position not being found, enrolment will be limited to reflect the availability of work term placements. In the event that a work term placement cannot be found, students may fulfil the M.Sc. requirements with courses only as described above.

#### Guidelines for Completion of Master's Degree

With the exception of those students in the physics in modern technology stream, full-time master's candidates are expected to complete all requirements in six terms of registered full-time study. Part-time master's candidates are expected to complete their degree requirements within an elapsed period of three to four calendar years after the date of initial registration.

Students in the physics in modern technology stream are normally expected to complete all their requirements in three successive terms of registered full-time study.

Programs - Physics

**Residence Requirement**

At least one year of full-time study (or equivalent).

**Ph.D. Physics**

**About the Program**

The fields of graduate study in the Department of Physics at Carleton are particle physics and medical physics.

In the particle physics program, specialization can be in theoretical or in experimental particle physics.

In the medical physics program, specialization can be in imaging physics, cancer therapy physics, or medical biophysics. Research supervision can be on campus or be provided at health care institutions and government laboratories in the Ottawa region. The Ph.D. program is accredited by CAMPEP ([campep.org](http://campep.org)).

The graduate program in physics is a joint program with the University of Ottawa as part of the Ottawa Carleton Institute for Physics (OCIP).

The fields of study offered by OCIP at the University of Ottawa are condensed matter physics, biological physics, and photonics.

Detailed information about our research program is available from the departmental website.

**Academic Regulations**

See the General Regulations section of this Calendar.

**Admission Requirements**

An M.Sc. in Physics, or a closely related field, is normally required for admission into the Ph.D. program.

Students who have been admitted to the M.Sc. program may be permitted to transfer into the Ph.D. program if they demonstrate academic abilities for advanced research in their field.

In exceptional cases, an outstanding student who has completed the honours B.Sc. will also be considered.

**Program Requirements (from M.Sc.)**

The normal requirements for the Ph.D. degree (after M.Sc.) are:

- A minimum of 2.0 credits of course work at the graduate level
- A comprehensive examination designed to demonstrate overall ability in physics and in the candidate's research area, normally within the first year of study. This takes the form of a written examination followed, if necessary, by an oral examination.
- Participation in the seminar series of the Ottawa-Carleton Institute for Physics.
- A thesis (8.0 credits) which will be defended at an oral examination. The examining board for all theses will include members of the Ottawa-Carleton Institute for Physics from both Departments of Physics. The external examiner of the thesis will be external to both Departments of Physics.
- Students in experimental or theoretical particle physics who lack any of the relevant courses recommended for the M.Sc. program must complete them (or the equivalents) by the end of their Ph.D. program. In addition they should complete PHYS 6601 and PHYS 6602

- Students in medical physics must have completed, either within this degree (as part of the minimum 2.0 course credits) or in prior graduate studies:

- (i) PHYS 5203, PHYS 5204, PHYS 5206, PHYS 5207, PHYS 5209, PHYS 5210, or their equivalents,
- (ii) 0.5 credit appropriate physics course from an area of physics outside medical physics.

In addition it is also strongly recommended to have completed 0.5 credit in a computational physics course, such as PHYS 5002, within the minimum 2.0 credits of this degree or in prior graduate studies.

**Guidelines for Completion of Doctoral Degree**

Full-time Ph.D. candidates admitted on the basis of an M.Sc. are expected to complete all requirements within an elapsed period of four to five years after the date of initial registration. Part-time Ph.D. candidates are expected to complete all requirements within an elapsed period of six years after the date of initial registration.

**Residence Requirements**

For the Ph.D. degree (from B.Sc.): at least three years of full-time study (or equivalent).

For the Ph.D. degree (from M.Sc.): at least two years of full-time study (or equivalent).

## Political Economy

Institute of Political Economy  
A818 Loeb Building  
Tel.: 613-520-7414  
carleton.ca/politiceconomy

- M.A. Political Economy
- Ph.D. with Specialization in Political Economy

### M.A. Political Economy

#### About the Program

The interdisciplinary nature of the M.A. Political Economy is designed to offer students an exposure to the core concepts of political economy and an opportunity to develop individual areas of research concentration. The program focuses on investigating the relationship between the economy and politics as they affect the social and cultural life of societies, and secondly, focuses on the historical processes whereby social change is located in the interaction of the economic, political, cultural, and ideological moments of social life. The curriculum includes courses with a political economy orientation offered by other departments, schools, and institutes.

#### Academic Regulations

See the General Regulations section of this Calendar.

All master's candidates must maintain B standing or better (GPA of 8.0). A candidate may, with the recommendation of the Institute and the approval of the Dean of the Faculty of Graduate Studies and Research, be allowed a grade of C+ in 0.5 credit.

#### Admission Requirements

The normal requirement for admission to the master's program is B.A. (Honours), with at least high honours standing, in one of the disciplines represented in the Institute. Prospective applicants without such qualifications may be considered for admission if they have both a strong academic record and relevant work experience.

#### Program Requirements

The Master of Arts in Political Economy is a 5.0 credit program, one of which may be at the 4000- (honours undergraduate) level. Each candidate, in consultation with the Institute, must select and follow one of two optional patterns:

- 3.0 credits, a thesis equivalent to 2.0 credits, and an oral examination of the thesis
- 4.0 credits, a research essay equivalent to 1.0 credit, and an oral examination of the research essay

Whichever pattern is selected, all students in the Institute are required to take PECO 5000 and PECO 5001, two 0.5-credit seminars offered by the Institute.

### Ph.D. with Specialization in Political Economy (Collaborative Program)

#### About the Program

The Collaborative Ph.D. with a Specialization in Political Economy is especially designed for doctoral students in participating programs in the Faculties of Arts and Social Science and Public Affairs and Management who wish to enrich their training in a particular discipline or area of study by developing a political economy approach through interdisciplinary dialogue.

The following units participate in the Collaborative Program in Political Economy:

- School of Canadian Studies
- Department of Geography
- Department of History
- Department of Political Science
- School of Public Policy and Administration
- Department of Sociology and Anthropology

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

Students who are enrolled in a doctoral program in one of the participating units may apply to the Institute of Political Economy for admission to the Collaborative Program. Admission to the program is determined by the Program Committee and will normally take place before the end of the first year of registration in one of the participating doctoral programs.

Admission requirements to the Collaborative Ph.D. with a Specialization in Political Economy are:

- Registration in the Ph.D. program of one of the participating units;
- Registration in, or successful completion of, at least one course or comprehensive field with political economy content. This will normally be a course offered by the student's home unit but could also be selected from appropriate courses in other units. See Selection of Courses for a list of acceptable courses;
- Selection of a thesis topic with political economy content. The Program Committee will determine, in consultation with the supervisor, if the political economy content of the thesis meets the requirements of the Collaborative Program.

#### Program Requirements

Students enrolled in the Collaborative Program in Political Economy must meet the requirements of their respective home units as well as those of the Collaborative Program. The requirements of the Collaborative Program do not, however, add to the number of credits students are required to accumulate by their home unit and the credit value of the degree remains the same.

The requirements of the Collaborative Program are:

1. 0.5 credit in PECO 6000 Political Economy: Core Concepts
2. In addition, the following requirement(s) specific to the doctoral programs of the supporting units:
  - Anthropology: a relevant political economy course from the approved list (0.5 credit)
  - Canadian Studies: a relevant political economy course from the approved list (0.5 credit) or the comprehensive in the major field of Policy, Economy and Society
  - Geography: PECO 6000 replaces GEOG 6003 or GEOG 6004 (0.5 credit), the field seminar The Geography of Societal Change, and students must register in GEOG 6906, the comprehensive The Geography of Societal Change.
  - History: HIST 6701 (0.5 credit) Directed Studies – History and Political Economy, or a relevant political economy course from the approved list (0.5 credit). The combination of the two courses will be considered as the second minor field of the student.

Programs - Political Economy

- Political Science: a relevant political economy course from the approved list (0.5 credit).
  - Public Policy and Administration: a relevant political economy course from the approved list (0.5 credit) .
  - Sociology: a relevant political economy course from the approved list (0.5 credit) or part of comprehensive preparation in the sub-field of political economy.
3. Submission and successful defence of a doctoral thesis on a political economy topic in the participating unit.

The proposed topic must be approved by the student's home unit and by the Program Committee. At least one of the student's advisors or members of the examining committee will be selected from among the core faculty for the Collaborative Program.

**Selection of Courses**

In addition to the graduate courses offered by, or associated with, the Institute, the courses listed below are relevant to students of political economy and would, with the prior approval of the Institute, be used to design a coherent and internally complementary set of courses to fulfil degree requirements. The list is not exclusive and is subject to change. Moreover, students in the Master's program may select 1.0 credit in political economy that is offered at the 4000-level.

Note: the number of spaces in graduate courses offered by other departments may be limited, and registration may be conditional upon obtaining the prior approval of the department concerned. It is the student's responsibility to ensure that permission is obtained from the appropriate department prior to registering in any of the following courses.

The Institute expects to attract high quality graduate students who will be likely to continue to a second post-graduate degree. Master's students will be directed to consult with the department where they might wish to pursue doctoral studies so that they may select courses that will prepare them for this next stage.

**Anthropology**

ANTH 5106, ANTH 5107, ANTH 5109, ANTH 5202, ANTH 5208, ANTH 5210, ANTH 5704, ANTH 5808, ANTH 5809

**Canadian Studies**

CDNS 5101, CDNS 5102, CDNS 5201, CDNS 5202, CDNS 5501, CDNS 5601

**Economics**

ECON 5403, ECON 5500, ECON 5504, ECON 5505, ECON 5507

**Geography**

GEOG 4207 Urban Development and Analysis  
 GEOG 4300 Comparative Environmental Movements  
 GEOG 4400 Environmental Geopolitics  
 GEOG 4401 Geographies of Globalization  
 GEOG 5005, GEOG 5200, GEOG 5400, GEOG 5500

**History**

HIST 5506, HIST 5508, HIST 5509, HIST 5800

**International Affairs**

INAF 5007, INAF 5101, INAF 5300, INAF 5303, INAF 5501, INAF 5502, INAF 5601

**Law**

LAWS 4001 Law, Family and Gender

LAWS 4002	Feminist Theories of Law
LAWS 5002, LAWS 5003, LAWS 5004, LAWS 5005, LAWS 5006, LAWS 5007, LAWS 5200, LAWS 5302, LAWS 5306	
<b>Political Science</b>	
PSCI 4000	Topics in Canadian Government and Politics
PSCI 4002	Policy Seminar
PSCI 4009	Quebec Politics
PSCI 4102	Politics of Western Liberal Democracies
PSCI 4103	The State in Advanced Capitalist Societies
PSCI 4104	Theory and Practice in Third World Development
PSCI 4105	Selected Problems in Third World Development
PSCI 4401	Business-Government Relations in Canada
PSCI 4500	Feminist Analysis in Comparative Perspective
PSCI 4505	Transitions to Democracy
PSCI 4603	Analysis of International Political Economy
PSCI 4604	Selected Problems in International Political Economy
PSCI 5003, PSCI 5008, PSCI 5101, PSCI 5105, PSCI 5107, PSCI 5202, PSCI 5501, PSCI 5502, PSCI 5504, PSCI 5507, PSCI 5509, PSCI 5607	
<b>Public Administration</b>	
PADM 5115, PADM 5213, PADM 5220, PADM 5224, PADM 5228, PADM 5702, PADM 5811, PADM 5813, PADM 5814	
<b>Social Work</b>	
SOWK 4102	Aboriginal Peoples and Social Policy
SOWK 4103	Practice and Policy in Immigration
SOWK 5102, SOWK 5105, SOWK 5106, SOWK 5301, SOWK 5805	
<b>Sociology</b>	
SOC 5000, SOC 5002, SOC 5007, SOC 5109, SOC 5204, SOC 5205, SOC 5209, SOC 5300, SOC 5301, SOC 5302, SOC 5308, SOC 5400, SOC 5404, SOC 5405, SOC 5408, SOC 5409, SOC 5500, SOC 5504, SOC 5607, SOC 5608, SOC 5804, SOC 5806	



## Political Management

Clayton H. Riddell Graduate Program in Political Management  
 Arthur Kroeger College of Public Affairs  
 D199 Loeb Building  
 Tel: 613-520-7560  
 carleton.ca/politicalmanagement

Subject to the approval of the Ontario Council on Graduate Studies (OCGS).

### Master of Political Management

#### About the Program

Housed administratively within the Arthur Kroeger College of Public Affairs, the Clayton H. Riddell Graduate Program in Political Management offers courses leading to the degree of Master of Political Management.

The M.P.M. program provides an intensive professional education that prepares its graduates for positions of responsibility and authority in electoral, legislative, and advocacy politics: as political staff to cabinet ministers and elected representatives; strategists and tacticians for political parties; campaign managers and communication advisers; and spokespersons for civil society organizations and grassroots movements.

The degree comprises 5.0 credits and has been designed so as to be completed in 10 months of full-time study.

#### Academic Regulations

See the General Regulations section of this Calendar.

A standing of B- or better must be obtained in each course or component counted towards the degree.

#### Admission Requirements

Applicants must:

- hold an honours baccalaureate or equivalent with at least high honours standing; and
- demonstrate a commitment to and aptitude for political management through prior involvement in party or campus politics, grassroots organization, political advocacy, or similar experience.

Although there is no formal second language requirement for the degree, individuals preparing for political professions in Canada should have or develop a facility in French.

Applicants whose first language is not English, or who have not completed a previous degree at an English-language university must demonstrate fluency in English via any one of the criteria outlined in the general regulations of the Graduate calendar.

#### Program Requirements

Students must complete:

- 3.0 credits of core courses, as listed below;
- 1.0 credit based on a practicum placement arranged through the program, combined with an integrative analytical research essay; and
- 1.0 credit of elective courses, as listed below.

#### Core courses:

POLM 5001 Institutions and Governance I  
 POLM 5002 Institutions and Governance II  
 POLM 5003 Strategic Communications I  
 POLM 5004 Strategic Communications II  
 POLM 5005 Political Management I  
 POLM 5006 Political Management II

#### Practicum and Research Essay:

POLM 5098

#### Elective courses:

POLM 5010 Polling and Opinion Research  
 POLM 5011 Political Campaigns  
 POLM 5012 Political Advocacy  
 POLM 5013 Political Management and the Media  
 POLM 5014 Political Marketing  
 POLM 5015 Political Policy Landscape

Other courses as approved by the Graduate Supervisor.

## Political Science

Department of Political Science

B640 Loeb

Tel.: 613-520-2777

carleton.ca/polisci

- M.A. Political Science
- Ph.D. Political Science
- Ph.D. Political Science with Specialization in Political Economy (listed under Political Economy)

### M.A. Political Science

#### About the Program

The Department of Political Science offers a 5.0 credit MA program. Most students complete this program in two years. The MA in Political Science emphasizes the development of theoretical competence and rigorous analytical skills in the study of politics. The program can be completed through coursework only, or through a combination of coursework and a thesis or major research paper. While there are no formal specializations within the degree program, students may choose courses from a wide variety of fields, including Political Theory, International Relations, Comparative Politics, Canadian Politics, Gender and Politics and Public Policy. All of these fields are well represented by internationally-recognized faculty members who are available for thesis and research essay supervision.

#### Academic Regulations

See the General Regulations section of this Calendar.

All master's candidates must obtain a B standing or better (GPA 8.0). One grade of C+ may be allowed.

#### Admission Requirements

The normal requirement for admission to the master's program is B.A.(Honours) (or the equivalent) in Political Science, with at least high honours standing.

The Faculty of Graduate Studies and Research requires applicants whose native language is not English to be tested for proficiency in English. Applicants to the Political Science graduate program must submit a CAEL Assessment score of a minimum of 70 or a TOEFL score of a minimum of 237 (computer-based) or 580 (regular).

Honours graduates in fields other than political science will be considered on the basis of their academic background and standing, and will be judged on a case-by-case basis. Those with only minor deficiencies may be required to take certain specified courses, while others whose degrees are less closely related to political science may be required to register in the qualifying year, at the discretion of the Department. Graduates of three-year programs in political science will be required either to complete the fourth year of an honours degree and reapply, or register in the qualifying year (see above), depending on work completed to date and academic standing.

#### Program Requirements

Details on all program requirements are provided in the departmental Guidelines for M.A. Candidates.

All master's candidates will fulfil a 5.0-credit program requiring departmental approval. A maximum of 1.0 credit may be taken at the 4000-level. The student may choose to take a maximum of 1.0 credit outside the Department of Political Science.

All candidates, in consultation with the Department, will pursue their degree by following one of three program patterns:

- 5.0 credits in approved courses
- Research Essay (1.0 credit) and 4.0 credits in approved courses
- Thesis (2.0 credits) and 3.0 credits in approved courses

All M.A. students must complete a language requirement prior to graduation. This language will normally be French, except where a degree of proficiency in another language is deemed appropriate in relation to the student's program of studies. The language requirement may be satisfied by passing a Departmental French language test. Departmental language tests are administered twice a year. The language requirement may also be satisfied by passing an approved language course with a grade of B- or better. This course will normally be FINS 2105. Students whose research interests require research skills beyond the basic methods requirement may obtain permission from the Department to substitute this advanced research skill for the language requirement.

It is anticipated that candidates will enter having taken some political theory at the undergraduate level. Those who have not will be required to take PSCI 2300, a 1.0-credit course over and above the normal M.A. program requirements.

It is anticipated that candidates will enter having taken a methods course at the undergraduate level. Those who have not may be required, depending on the course pattern chosen, to take PSCI 5700, a 0.5-credit course which can be included as part of the 5.0-credit requirement. When appropriate and related significantly to the program of study, another methods course, such as PSCI 5304, PSCI 5701 or PSCI 5702 may be substituted for PSCI 5700.

#### Defences

In the case of the student choosing a thesis, the thesis will be evaluated by three people: the student's thesis supervisor from the Department, a second reader from the Department, and an external third reader who is generally from another Carleton Department but may sometimes come from outside the University. A thesis must be defended orally before the three evaluators. No letter grade is assigned, but notations of Pass with Distinction, Satisfactory, and Unsatisfactory are assigned.

In the case of the student choosing a research essay, that essay will be evaluated by two of the Department's faculty members including the supervisor and a second reader, and a letter grade will be assigned. An oral defence of the essay is not required but may be requested by the supervisor or second reader.

#### Co-op Option

A co-op option is available to full-time students in the M.A. program. Students admitted to this option must satisfactorily complete at least two work terms in order to graduate with a co-op designation on their transcripts. These work terms are four months in duration and locate students in government departments or other organizations in order to work at a junior officer level. Students register in one of PSCI 5911, PSCI 5912 or PSCI 5913 Co-operative Work Term; however the coordination of the work terms is done by the University's Co-op office.

**Washington Center Internship Program**

The Washington Center Internship Program is open to full time master's students who have completed at least two terms of study at Carleton. Admission is open to students with at least a 9.5 GPA in Political Science graduate courses. Successful completion of the program satisfies the requirements for one term of full-time study (1.5 credits). Students spend one term (fall, winter or summer) in Washington, D.C. They serve four days a week as an intern in Washington, D.C. and also take two seminar courses offered by faculty of The Washington Center. The normal 1.5 credit course load for participants in the program is:

- PSCI 5904 (0.5 credit), Washington Center Internship
- PSCI 5905 (0.5 credit), Washington Center Seminar I
- PSCI 5906 (0.5 credit), Washington Center Seminar II

Full information on the program and application forms can be obtained from the Department of Political Science.

**Course Selection**

Within the scope of the regulations, the following undergraduate courses (fully described in the Undergraduate Calendar) may be taken by M.A. students.

Please note that not all of these courses are offered every year. Students should consult the timetable published each year in early June.

**Political Science**

PSCI 4000	Topics in Canadian Government and Politics
PSCI 4002	Policy Seminar: Problems of Northern Development
PSCI 4003	Politics and the Media
PSCI 4005	Stability, Justice and Federalism
PSCI 4008	National Security and Intelligence in the Modern State
PSCI 4009	Quebec Politics
PSCI 4103	The Modern State
PSCI 4104	Theory and Practice in Third World Development
PSCI 4105	Selected Problems in Third World Development
PSCI 4107	Political Participation in Canada
PSCI 4108	Canadian Provincial Government and Politics
PSCI 4109	The Politics of the Canadian Charter of Rights and Freedoms
PSCI 4204	Elections
PSCI 4205	Identity Politics
PSCI 4207	Globalization, Adjustment and Democracy in Africa
PSCI 4208	Queer Politics
PSCI 4302	Political Thought in the Modern Muslim Middle East
PSCI 4304	Political Inquiry
PSCI 4305	Contemporary Political Theory
PSCI 4308	History of Political Inquiry
PSCI 4309	Contemporary Approaches to Political Enquiry

PSCI 4310	Political Theories of Democracy and Empire
PSCI 4400	Socio-Technical Change and Public Policy Design
PSCI 4402	Gender, State, and Public Policy
PSCI 4403	Reproductive Rights Policy in North America
PSCI 4407	Public Policy: Content and Creation
PSCI 4408	Public Affairs Management and Analysis
PSCI 4409	Issues in Development Management
PSCI 4500	Gender and Globalization
PSCI 4501	Gender and Politics in Post-Communist Societies
PSCI 4502	Post-Soviet States and Societies
PSCI 4503	Politics of Central Eurasia
PSCI 4505	Transitions to Democracy
PSCI 4506	Women and Politics in North America
PSCI 4601	Foreign Policies of Soviet Successor States
PSCI 4602	Bargaining and Negotiation
PSCI 4603	Analysis of International Political Economy
PSCI 4604	Selected Problems in International Political Economy
PSCI 4605	Gender in International Relations
PSCI 4606	American Foreign Policy
PSCI 4607	Politics of North America
PSCI 4609	European Integration and European Security
PSCI 4800	Advanced International Relations Theory
PSCI 4801	Selected Problems in Global Politics
PSCI 4802	International Politics of Africa
PSCI 4803	Foreign Policies of Major East Asian Powers
PSCI 4804	International Relations of South and Southeast Asia
PSCI 4806	Transatlantic Security Issues
PSCI 4807	Migration and Mobility: Politics of Citizenship and Identity
PSCI 4808	Global Environmental Politics
PSCI 4817	International Politics of Forced Migration
PSCI 4818	The Environmental State

Students are encouraged to look for courses within Carleton in the Departments of Economics, Geography, History, Law, Philosophy, and Sociology and Anthropology; the Schools of Business, Journalism and Communication, Public Administration, and the Norman Paterson School of International Affairs; and in the Institutes of European and Russian Studies, and Political Economy. They are equally strongly encouraged to look for courses in the Departments of Political Science and Philosophy at the University of Ottawa.



All courses selected will be subject to the approval of the Department, on grounds of appropriateness to the program of study and the avoidance of excessive overlap between courses.

## Ph.D. Political Science

### About the Program

The Department of Political Science offers a 10.0 credit Ph.D. program. The Ph.D. program offers rigorous, focused study in two fields of Political Science. It includes coursework in two fields, comprehensive examinations in these fields, training in methodology, and the doctoral dissertation. Students choose two of the following fields: Political Theory, International Relations, Comparative Politics, Canadian Politics, and Public Policy. All of these fields are well represented by internationally-recognized faculty members who are available for research supervision. The Ph.D. in Political Science emphasizes the development of theoretical competence and rigorous analytical skills in the study of politics. Doctoral students are also eligible to apply for the Collaborative Ph.D. in Political Economy.

### Academic Regulations

See the General Regulations section of this Calendar.

### Admission Requirements

The Ph.D. program in political science normally will be undertaken on a full-time basis. However, in cases of exceptional merit, the Department may accept a few candidates for the degree on a part-time basis.

The normal requirement for admission to the Ph.D. program is a master's degree (or its equivalent) in political science with high honours standing or better.

The Faculty of Graduate Studies and Research requires applicants whose native language is not English to be tested for proficiency in English. Applicants to the Political Science graduate program must submit a CAEL Assessment score of a minimum of 70 or a TOEFL score of a minimum of 237 (computer-based) or 580 (regular).

Applicants should note, however, that meeting the admission requirement does not guarantee admission to the program. Review of the department's competitive selection process indicates that students with a GPA below 10.0 (A-) in the master's program are generally not recommended for admission to the doctoral program. Students applying on the basis of a master's degree from other disciplines will be considered on a case-by-case basis, and may be required to take additional courses as part of the program.

### Program Requirements

Details on all program requirements are provided in the departmental Guidelines for Ph.D. Candidates.

The normal program requirements for Ph.D. candidates are outlined in the General Regulations section of this Calendar.

It is anticipated that Ph.D. candidates will enter having taken some political theory at the undergraduate level, regardless of their desired field of specialization. Those who have not will be required to take PSCI 2300, a 1.0-credit course in addition to the normal Ph.D. requirements.

If statistical proficiency is needed for the preparation of the thesis, students will also be expected to take a course in research methods which can be included as part of the 10.0-credit requirement (see section titled Research Skill Requirement).

All Ph.D. candidates will fulfil a 10.0-credit program requiring departmental approval. The student may choose to take a maximum of 1.0 credit outside the Department of Political Science.

At least 1.0 credit at the graduate level in each of the candidate's two major fields of study; a GPA of 9.0 or better must be obtained in these courses for students to be allowed to proceed to the comprehensive examinations.

Satisfactory completion of PSCI 6900 (0.5 credit), Ph.D. Field Examination I and PSCI 6905 (0.5 credit), Ph.D. Field Examination II. Field examinations are normally written on two occasions each year, in April and August.

Proficiency in a research skill, as outlined under research skill requirement

At least 1.0 credit will normally be taken during the second year of the program in fields allied to the major topics of the thesis. This credit will normally be fulfilled through regular course work rather than tutorials.

Successful completion of PSCI 6906 (1.0 credit)

A public defence, in English, of a written thesis proposal

A 5.0-credit thesis, written in English or French, which will be defended publicly in English at an oral examination.

Full-time students are normally required to complete the comprehensive examinations within 12 months of entering the program, and must normally complete the public defence of the thesis proposal, preceded by its formal acceptance by the supervisory committee, within 24 months of entering the doctoral program.

Upon entry to the program, each Ph.D. candidate will be assigned a faculty member to advise them on their studies. Students' programs, including the choice of supervisor and the thesis committee, must be approved by the Department. The thesis supervisor will normally be chosen from among faculty members in the Department of Political Science. Upon approval of the thesis supervisor and the Department, committee members may be chosen from elsewhere within the University.

### Research Skill Requirement

Ph.D. candidates must demonstrate the ability to use a research skill appropriate to their program. The research skill requirement will normally be satisfied before the defence of the thesis proposal, and will take one of the following forms:

- An ability to read and translate French or another language appropriate to their course of study; or the ability to speak a language other than English sufficient to conduct interviews in that language
- An approved political science methods course, workshop, or colloquium, equivalent to 0.5 credit; or any one of the following courses (or an approved alternative): PSCI 5700, PSCI 5701, or PSCI 5702.

### Comprehensive Examinations

All Ph.D. candidates must successfully complete a written comprehensive examination in each of their two major fields. Field examinations normally take place once per year, in August. At the discretion of the Department, candidates may be required to take an oral examination following the written examination.

The fields of study for the Ph.D. comprehensive examination are to be chosen from the following list:



**Political Theory**

- Democracy in the Age of Global Technology
- Politics, Statecraft and the Common Good
- Tradition, Interpretation and Civic Hermeneutics
- Ideology, Power and Political Morality
- Politics and Statecraft in Non-Western Traditions
- Religion, Civil Association and Individualism
- Collective Identities: Gender, Race and Nation

**Public Affairs and Policy Analysis**

- Canadian and Comparative Public Sector Reform
- Public Policy, Public Opinion and Public Belief Systems
- Methods for Quantitative Analysis and Evaluation
- Gender and Race in Public Policy and Administration
- Socio-Technical Change and Policy Design
- Political Communication, Political Persuasion and Social Marketing
- Domestic Security Policy and Management

**Canadian Government and Politics**

- Federalism and the Constitution
- Political Institutions and Processes
- Political Culture and Socialization
- Political Economy
- Provincial, Territorial and Local Government and Politics
- Administration and Public Policy Analysis
- Foreign Policy and Relations
- Canadian Political Thought and Ideology
- Gender and the State
- The Politics of Identity, Difference and Movements for Change
- Communications and Media

**International Relations**

- Foreign Policy Analysis
- Gender and International Relations
- Global Governance and International Organization
- Global Political Economy
- International Development
- International Political Sociology
- International Relations Theory
- International Security

**Comparative Government and Politics****a) Countries and Areas**

- Europe and the European Union
- Russia and Soviet Successor States
- North America
- Latin America
- Africa
- Asia
- Middle East

**b) Topics or Themes**

- State and Civil Society
- Political Governance and Institutions
- Development
- Social Movements
- Nationalism, Citizenship, Race and Ethnicity
- Political Behavior
- Gender and Politics
- Political Economy

**Thesis Proposal**

All students must publicly defend a thesis proposal after completing their comprehensive examinations. Full-time students must complete this requirement within the first two years of registration in the program.

## Psychology

Department of Psychology  
 B550 Loeb Building  
 Tel.: 613-520-2644  
[carleton.ca/psychology](http://carleton.ca/psychology)

- M.A. Psychology
- Ph.D. Psychology

### M.A. Psychology

#### About the Program

The field of psychology is dedicated to the scientific study of thoughts, feelings and actions from multiple perspectives (e.g., social, developmental, biological, etc.). The M.A. program offered by the Department of Psychology is strongly research-oriented and provides students with an exciting blend of coursework, hands-on research experience, and community practice. Being situated in Ottawa, our M.A. students are exposed to unique research opportunities and can access Carleton's many connections to agencies in the nation's capital. Faculty members in the department supervise students in a range of psychological disciplines including cognitive, developmental, forensic, health, applied, and personality/social. Many of our graduates find immediate employment upon completion of their M.A. degree, whereas other students use their M.A. as preparation for further doctoral-level studies. For more information about the Department's M.A. program, consult the following website: [carleton.ca/psychology](http://carleton.ca/psychology)

#### Admission Requirements

The normal requirement for admission into the master's programs is a B.A. Honours Psychology (or equivalent) with high honours standing, completion of a research thesis, and credit in a breadth of courses in line with the psychology major.

Candidates with particular course deficiencies may be required to register in additional courses at Carleton.

#### Qualifying Year

Occasionally, candidates with exceptional promise who offer less than Honours B.A. status may be admitted to a qualifying-year program approved by the graduate studies committee and designed to prepare them for master's study. A grade of B- or better must be obtained in each qualifying-year course, and candidates may be required to complete satisfactorily the equivalent of a B.A. (Honours) thesis.

#### Program Requirements

The master's program consists of 5.0 credits, of which at least two must be at the graduate level (numbered 5000 or higher), and a thesis (equivalent to 2.5 credits) which must be defended at an oral examination.

Specific requirements include:

- 1.0 credit in PSYC 5410 Advanced Analysis of Variance and PSYC 5411 Advanced Regression. Equivalencies will be determined on a case-by-case basis through application to the graduate committee;
- PSYC 5906 Pro-Seminar in Psychology.

### M.A. Concentrations

The following courses are recommended for M.A. students in the concentrations:

#### Concentration in Applied Psychology

PSYC 5012, PSYC 5105, PSYC 5106 and PSYC 5700, and to generate a thesis in applied psychology.

#### Concentration in Personality and Social Psychology

PSYC 5010, PSYC 5011, PSYC 5109 and PSYC 5601 and to generate a thesis in personality or social psychology.

#### Concentration in Cognitive Psychology

PSYC 5700, PSYC 5703, PSYC 5704 and PSYC 6700 and to develop a thesis in cognitive psychology.

#### Concentration in Developmental Psychology

PSYC 5500, PSYC 5503, and PSYC 5504, and to generate a thesis in developmental psychology.

#### Concentration in Forensic Psychology

PSYC 5021, PSYC 5022, PSYC 5023, and PSYC 5024.

#### Concentration in Health Psychology

PSYC 5209, and to generate a thesis in health psychology.

### Ph.D. Psychology

#### About the Program

The field of psychology is dedicated to the scientific study of thoughts, feelings and actions from multiple perspectives (e.g., social, developmental, biological, etc.). The Ph.D. program offered by the Department of Psychology is strongly research-oriented and emphasises hands-on training. In addition to exciting opportunities for developing research collaborations within the Department and across the University, students can enrol in a range of graduate courses and participate in community practice. Being situated in Ottawa, our students are exposed to unique research opportunities and can access Carleton's many connections to agencies in the nation's capital. Faculty members in the department supervise students in a range of psychological disciplines including cognitive, developmental, forensic, health, applied, and personality/social. Graduates of our Ph.D. program find employment in a diversity of settings, including academic institutions, government agencies, and the private sector. For more information about the Department's Ph.D. program, consult the following website: [carleton.ca/psychology](http://carleton.ca/psychology)

#### Admission Requirements

The requirements for admission to the Ph.D. program are outlined in the General Regulations section of this Calendar. Scores on the Graduate Record Examination are optional.

The Ph.D. program in psychology normally will be undertaken on a full-time basis; however, in cases of exceptional merit, the Department will accept a few candidates for the degree on a part-time basis.

#### Program Requirements

The minimum program requirements for the Ph.D. degree in Psychology include 10.0 credits with a grade of B- or better in each course. Specific requirements are:

- 1.0 credit in PSYC 5410 Advanced Analysis of Variance and PSYC 5411 Advanced Regression
- 0.5 credit from: PSYC 5401 Multivariate Techniques, PSYC 5412 Topics in Advanced Statistics and Methods, PSYC 5413 Workshops in Advanced Statistics and Methods, or other as approved by the graduate committee (e.g.,

Programs

PSYC 5010). Equivalencies will be determined on a case-by-case basis through application to the graduate committee;

- Any additional concentration requirement;
- PSYC 6906 Pro-Seminar in Psychology I and PSYC 6907 Pro-Seminar in Psychology II;
- PSYC 6909 Ph.D. Thesis, equivalent to 7.0 of the required 10.0 credits which must be defended at an oral examination.
- All Ph.D. candidates are required to submit a thesis prospectus. The prospectus examination will normally be successfully completed within seven calendar terms of the student's initial registration for full-time students and ten terms for part-time students.

#### **Concentrations**

The following courses are recommended for students in the concentrations.

##### **Concentration in Applied Psychology**

PSYC 5012, PSYC 5105, PSYC 5106 and PSYC 5700, and to generate a thesis in applied psychology.

##### **Concentration in Personality and Social Psychology**

PSYC 5010, PSYC 5011, PSYC 5109 and PSYC 5601 and to generate a thesis in personality or social psychology

##### **Concentration in Cognitive Psychology**

PSYC 5700, PSYC 5703, PSYC 5704 and PSYC 6700 and to develop a thesis in cognitive psychology.

##### **Concentration in Developmental Psychology**

PSYC 5500, PSYC 5503, and PSYC 5504, and to generate a thesis in developmental psychology.

##### **Concentration in Forensic Psychology**

Students interested in this area are encouraged to take courses such as PSYC 5021, PSYC 5022, PSYC 5023, and PSYC 5024 and to generate a thesis in the area of forensic psychology

##### **Concentration in Health Psychology**

PSYC 5209, and to generate a thesis in health psychology.

## Public Administration

School of Public Policy and Administration

Room 1001, Dunton Tower

Tel: 613-520-2547

carleton.ca/sppa

- M.A. Public Administration
- Ph.D. Public Policy
- Collaborative Ph.D. Public Policy with Specialization in Political Economy (Specialization requirements listed under Political Economy)
- Graduate Diplomas in Public Policy and Administration

### M.A. Public Administration

#### About the Program

The M.A. in Public Administration is a professionally-relevant academic degree. It provides a rigorous preparation for careers in public policy and administration, recognizing that those careers may span the public, private and third sectors. It can also serve as a preparation for subsequent post-graduate education. Through the core and elective courses, the program strengthens the analytical and conceptual skills that address the political, economic, organizational, and normative aspects of public policy issues. The core courses cover material fundamental to the understanding of those issues. The electives enable students to align the program with their own personal or professional interests as defined under one of four concentrations: Policy Analysis; Public Management; Innovation, Science and the Environment; or International and Development.

#### Academic Regulations

See the General Regulations section of this Calendar.

A grade of B- or higher must normally be obtained in each course credited towards the M.A. degree. A candidate may, with the recommendation of the M.A. Supervisor and the approval of the Dean of the Faculty of Graduate and Postdoctoral Affairs, be allowed a grade of C+ in courses totaling 1.0 credit.

#### Admission Requirements

Applicants must have a bachelor's degree (or equivalent). Normally, an average of B+ or higher is required for admission. The level of academic performance and potential demonstrated within the degree is more important than the discipline. Indeed, students enter the program from a wide variety of academic backgrounds in the social sciences, humanities, sciences and engineering. The School also considers mid-career applicants who do not have a bachelor's degree, but who have demonstrated professional excellence over a number of years of work in the public sector.

All applicants must have completed a 1.0-credit university course covering micro- and macroeconomic theory (ECON 1000 or the equivalent) and a 0.5-credit university political science course at the second-year level or higher, dealing with institutions and processes by which governments legitimize and exercise power, ideally in a Canadian setting (PSCI 2003 or equivalent). A working knowledge of algebra is also expected.

In some cases, applicants may be admitted to the program despite not having completed one of these pre-requisite courses in economics or political science, on the condition that the course be completed (with a grade of B- or higher) in the first year of the program. Nevertheless it is strongly recommended that students complete the prerequisites before

starting the program, to ensure that their progress through the core courses is unimpeded.

Students whose first language is not English, or who have not completed a previous degree at an English speaking university, must demonstrate an adequate command of English by attaining, at least, a TOEFL score of 580 written, or 237 CBT (computer-based test) or 86 IBT (internet-based test) with a minimum score in each component (22 in writing, 22 in speaking, 20 in reading, and 20 in listening), or a CAEL score of 70, or an IELTS score of 7.0.

Students may receive advanced standing with transfer of credit for up to 2.5 credits. Advanced standing will be considered only for core courses. It will be determined on an individual basis in consultation with the M.A. Supervisor and the Faculty of Graduate and Postdoctoral Affairs and pursuant to Section 6.1 of the General Regulations section of this Calendar. In general, a grade of B+ or higher is necessary in the equivalent courses in order to receive advanced standing.

Note that, because of the number of applications received, possession of these admission requirements does not, in itself, guarantee admission to the program.

#### Program Requirements

The M.A. in Public Administration is a 7.5- credit program. Students must complete:

1. 3.5 credits of core courses;
2. 2.0 credits from courses in one of the four Concentrations offered by the School; and
3. 2.0 other approved credits.

The seven core courses are listed under A, below. Full-time students normally complete the core courses during their first two semesters of study. Part-time students normally complete the core courses before proceeding to the remainder of the program.

The courses for the four concentrations are listed under B, below.

With respect to the remaining 2.0 approved credits, students may select:

- additional courses in their chosen concentration; and/or
- electives listed under other concentrations; and/or
- graduate courses in other units (with the approval of the M.A. Supervisor); and/or
- a research essay (1.0 credit), a thesis (2.0 credits), or by taking courses from the School's Ph.D. program (with the approval of the M.A. Supervisor).
- All students will graduate with at least one area of concentration, but students may structure their program to satisfy the requirements (at least 2.0 credits) for a second concentration. In this case, each course may count towards only one concentration.
- While there is no formal second language requirement, students planning careers in or with governments in Canada are strongly encouraged to develop facility with French.
- A co-operative education option is available to full-time students in the M.A. program. Students admitted to this option must satisfactorily complete at least two work terms in order to graduate with a co-op designation on their transcripts and diplomas. These work terms are



four months in duration and locate students in government departments or other organizations in order to work at a junior officer level. They provide students with opportunities to integrate the theoretical and practical aspects of public administration. During a work term, students will register in one of the co-op work term courses: PADM 5301, PADM 5302, or PADM 5303. While on a work term, students are limited to an additional 0.5 credit course. It should be noted that most co-op positions in the federal public service are restricted to Canadian citizens.

**A. Core Courses**

PADM 5111	Microeconomics for Policy Analysis
PADM 5112	Macroeconomics for Policy Analysis
PADM 5113	Research Methods and Design I
PADM 5114	Research Methods and Design II
PADM 5115	Introduction to State and Society
PADM 5116	Policy Analysis and Contemporary Governance
PADM 5117	Public Management

**B. Concentrations**

To complete a concentration, students must complete at least four of the courses (2.0 credits) listed as electives for that concentration. A course cross-listed between concentrations qualifies for either concentration but may count toward only one of them.

**Policy Analysis Concentration**

The Policy Analysis Concentration provides an understanding of approaches to policy analysis in a variety of disciplines, with insights drawn from economics, political science and the policy sciences broadly understood, from Canadian and comparative perspectives. It includes not only courses that focus on the theory, methods, or practice of policy analysis, but also courses that focus on specific policy fields. For clarity, the courses are grouped under these two categories below.

Students are required to take 2.0 credits selected from:

**Theory, Methods and Policy Processes**

PADM 5211	Intergovernmental Relations
PADM 5212	Civil Society and Public Policy
PADM 5213	Gender and Public Policy
PADM 5214	Budgetary Policy in the Public Sector
PADM 5215	Benefit-Cost Analysis
PADM 5216	Economic Models of Politics and Public Policy
PADM 5217	Applied Microeconomic Policy Analysis
PADM 5218	Analysis of Socio-economic Data
PADM 5219	Advanced Statistical Policy Analysis
PADM 5420	Policy and Program Evaluation

**Field Courses**

PADM 5220	Regulation and Public Policy
PADM 5221	Health Policy in Canada
PADM 5222	Economics and Health Policy
PADM 5223	Canadian Economic Policy
PADM 5224	Aboriginal Policy

PADM 5225	Trade Policy
PADM 5226	Tax Policy
PADM 5227	Education Policy
PADM 5228	Social Policy
PADM 5229	The Health of Populations
PADM 5272	Policy Seminar (Policy Analysis Concentration)
PADM 5291	Directed Studies (Policy Analysis Concentration)
PADM 5616	Environmental Policy

Other courses as approved by the M.A. Supervisor.

**Public Management Concentration**

The Public Management Concentration provides an understanding of the institutions and practices of modern states. This includes theoretical and technical approaches to accountability, leadership, implementation and evaluation, fiscal control, ethics, and organizational development and analysis.

Students are required to take 2.0 credits from:

PADM 5411	Organization Theory
PADM 5412	Ethics and Accountability in the Public Sector
PADM 5413	Law of Public Authorities I
PADM 5414	Law of Public Authorities II
PADM 5415	Strategic Management in the Public Sector
PADM 5416	Budgetary Management for the Public Sector
PADM 5417	Principles of Finance
PADM 5418	Human Resources Management
PADM 5419	Industrial Relations and Public Sector Collective Bargaining
PADM 5420	Policy and Program Evaluation
PADM 5421	Globalizing Public Management
PADM 5422	Urban and Local Government
PADM 5423	Third Sector Governance and Management
PADM 5424	Evaluation Cases and Applications
PADM 5472	Policy Seminar (Public Management Concentration)
PADM 5491	Directed Studies (Public Management Concentration)
PADM 5211	Intergovernmental Relations
PADM 5215	Benefit-Cost Analysis
PADM 5814	Program and Project Management

Other courses as approved by the M.A. Supervisor

**Innovation, Science and Environment Concentration**

The Innovation, Science and Environment Concentration provides an understanding of the problems and opportunities that confront governments, firms and society in making and implementing innovation, science and environment policies in an increasingly knowledge and information-based economy and society.

Students are required to take 2.0 credits from:

PADM 5611	Science and Technology Policies
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Programs - Public Administration

PADM 5612	Industrial Policy, Innovation and Sustainable Production
PADM 5613	Science, Risk and Evaluation
PADM 5614	Natural Resource Management
PADM 5615	Politics and Policy of Energy in Canada
PADM 5616	Environmental Policy
PADM 5617	Implementing Sustainable Development in Industrialized Countries
PADM 5618	Environmental and Ecological Economics
PADM 5619	Urban Sustainability
PADM 5620	The Science, Politics and Economics of Global Climate Change
PADM 5672	Policy Seminar (Innovation, Science and Environment Concentration)
PADM 5691	Directed Studies (Innovation, Science and Environment Concentration)
PADM 5220	Regulation and Public Policy

Other courses as approved by the M.A. Supervisor.

**International and Development Concentration**

The International and Development Concentration provides an understanding of the problems and opportunities confronting citizens, national administrative systems and policy makers in different types of economies in an increasingly integrated and competitive world.

Students are required to take 2.0 credits from:

PADM 5811	The International Policy Framework
PADM 5812	Governance in Developing Countries
PADM 5813	The Evolution of World Bank/IMF Policy Conditionality
PADM 5814	Program and Project Management
PADM 5815	Civil Society Organizations and Development
PADM 5816	Program Evaluation in Developing Countries
PADM 5817	Health Policy in Developing Countries
PADM 5818	Theories of Development
PADM 5872	Policy Seminar (International and Development Concentration)
PADM 5891	Directed Studies (International and Development Concentration)
PADM 5213	Gender and Public Policy
PADM 5225	Trade Policy
PADM 5421	Globalizing Public Management

Other courses as approved by the M.A. Supervisor.

**Ph.D. Public Policy**

**About the Program**

The Ph.D. focuses on the study of public policy, including its formation, evolution and implementation. The primary focus is on Canada in an international or comparative context, though students interested

in research with an explicitly international and comparative perspective will also find the program conducive to their work, depending on the field of specialization chosen. The program is based on the view that multi-disciplinary perspectives are essential to an understanding of the public sector and public policy-making..

The program has two primary objectives:

- to contribute to the advancement of research and teaching of public policy by drawing on various theoretical frameworks, multi-disciplinary perspectives, and applied methodologies
- to develop scholars and researchers for positions in universities, private research institutions, and various other public and private organizations

**Academic Regulations**

See the General Regulations section of this Calendar.

**Admission Requirements**

Admission will be judged primarily on the applicant's ability to conduct advanced research and to complete the program successfully. Applications should contain at least one essay or paper at the M.A. level written by the applicant, as well as a statement of research interests and potential thesis topics.

Admission requires completion of an M.A. degree in any of public administration, political science, economics, political economy, business administration, law, or similar degree with first class standing (A- average or higher in their M.A. work).

A working knowledge of basic calculus is required for completion of the program. Assistance in acquiring these skills is provided by the program. Students requiring additional assistance should consult the Ph.D. Supervisor.

Applicants must also successfully complete prerequisites in statistics, political science, and economics as described in detail below. These prerequisites may be satisfied by the completion of appropriate course work at the intermediate undergraduate level or higher in each of the subjects listed.

Prerequisites in political science, economics and statistics must be completed prior to entry. Completed courses in political science should be approximately equivalent to PADM 5115 or PADM 5116. With permission of the Ph.D. Supervisor, this requirement may be done, as a directed study in the summer, prior to registration in the program, under the supervision of faculty in the School. Completed courses in economics should be approximately equivalent to PADM 5111. Equivalent courses may be taken at most universities throughout the academic year. Completed course in statistics should be approximately equivalent to PADM 5114. Applicants should seek advice from the Supervisor of the Ph.D. program about whether particular courses are acceptable as prerequisites.

Students whose first language is not English, or who have not completed a previous degree at an English speaking university, must demonstrate an adequate command of English by attaining, at least: a TOEFL score of 580 written, or 237 CBT (computer-based test), or 86 IBT (internet-based test) with a minimum score in each component (22 in writing, 22 in speaking, 20 in reading, and 20 in listening); or a CAEL score of 70; or an IELTS score of 7.0.

Advanced standing will not normally be granted for any of the required courses described below. If granted, advanced standing will be limited to 1.0 credit.

Enrolment is limited and possession of the minimum requirements does not, in itself, guarantee acceptance.

### Program Requirements

The program consists of the following elements:

- 3.5 credits of course work;
- Preparation for and writing of one comprehensive examination, normally written in the summer term of the first year equivalent to 0.5 credit;
- Public defence of a written thesis proposal;
- A thesis equivalent to 6.5 credits;
- A language requirement.

### Course Components

Courses will normally be taken in the first year. Students in the doctoral program are required to complete the following:

- 2.0 credits in: PADM 6111, PADM 6112, PADM 6113, PADM 6114. A GPA of 9.0 (B+) or better overall must be obtained in these courses before proceeding to the comprehensive examination.
- 0.5 credit in PADM 6200 Doctoral Seminar;
- 1.0 credit that constitutes one area of specialization beyond the public policy foundations covered in the core courses. These courses will be chosen by the student after consultation with, and approval by, the student's academic supervisor and the Ph.D. Supervisor. The fields of specialization are: Public Management; Policy Analysis; Innovation, Science, and Environment; Health and Social Policy; and International and Development Policy.
- These courses will normally be graduate courses offered by the School or by the Departments of Political Science and Economics, or directed studies (PADM 6901 and PADM 6902). However, other courses may be approved. Doctoral students taking courses at the master's level will be subject to enhanced course requirements. When necessary, students must arrange formal approval from the relevant department for admission to courses.

### Comprehensive Examinations

Students will write a comprehensive examination, normally in the summer term of the first year. This examination will focus on the area of specialization (including the Collaborative Ph.D. in Political Economy) they chose in conjunction with the two elective courses. In addition to those courses, each comprehensive examination will have a supplementary reading list. At the discretion of the examining board, a candidate whose performance is not fully satisfactory may be asked to take an oral examination or a second written examination. A GPA of 9.0 (B+) or higher overall must be obtained in the required courses before proceeding to the comprehensive examination.

### Thesis

Following the successful completion of the comprehensive examinations, students will prepare a formal thesis proposal under a committee composed of the supervisor and two other faculty members. The thesis supervisor will normally be a faculty member from the School of Public Policy and Administration. Under normal circumstances, the proposal must be defended by the end of the spring term of the

second year of full-time registration. The thesis must demonstrate an advanced ability to integrate the politics and economics of public policy. The thesis must be defended at an oral examination.

### Language Requirement

Students will be required to demonstrate a reading knowledge of French. Another language may be substituted for French, if it is relevant to the thesis.

## Graduate Diplomas in Public Policy and Administration

### About the Program

The Graduate Diplomas serve the needs for continuous learning by public servants and other professionals who seek to strengthen or broaden their conceptual and technical skills in particular areas of public policy and administration. Those areas are: Health Policy; Public Management; Public Policy and Program Evaluation; and Sustainable Development.

### Academic Regulations

See the General Regulations section of this Calendar.

All candidates are required to obtain a grade of B- or higher in each course in the program.

### Admission Requirements

Applicants must have a bachelor's degree (or equivalent). Normally, an average of B+ or higher is required for admission.

Students taking PADM 5111 or PADM 5112 must have completed a 1.0-credit university course covering micro- and macroeconomic theory (ECON 1000 or the equivalent).

Students taking PADM 5116 or PADM 5117 must have completed a 0.5-credit university political science course at the second-year level or higher dealing with the institutions and processes by which governments legitimize and exercise power, ideally in a Canadian setting (PSCI 2003 or equivalent). Several years of relevant professional experience in the public sector may be considered as equivalent to this prerequisite.

Students whose first language is not English, or who have not completed a previous degree at an English speaking university, must demonstrate an adequate command of English by attaining, at least: a TOEFL score of 580 written, or 237 CBT (computer-based test), or 86 IBT (internet-based test) with a minimum score in each component (22 in writing, 22 in speaking, 20 in reading, and 20 in listening); or a CAEL score of 70; or an IELTS score of 7.0.

**Note: students in the Diploma programs are not eligible to receive university funding.**

### Program Requirements

Each of the Diplomas comprises 3.0 credits. The composition of the required and elective courses varies by specialization, as outlined below. The Diplomas are designed to be completed in two years while working full-time, although students may take the program on either a part-time or full-time basis.

### Public Policy and Program Evaluation

Students must complete:

1. 2.0 credits of required courses:
  - PADM 5113 Research Methods and Design I
  - PADM 5114 Research Methods and Design II
  - PADM 5420 Policy and Program Evaluation
  - PADM 5424 Evaluation Cases and Applications
2. 1.0 credit in electives from the following list:
  - PADM 5116 Policy Analysis and Contemporary Governance

## Programs - Public Administration

- PADM 5117 Public Management
- PADM 5213 Gender and Public Policy
- PADM 5215 Benefit-Cost Analysis
- PADM 5217 Applied Microeconomic Policy Analysis
- PADM 5218 Analysis of Socio-economic Data
- PADM 5219 Advanced Statistical Policy Analysis
- PADM 5220 Regulation and Public Policy
- PADM 5272 Policy Seminar (Policy Analysis)
- PADM 5411 Organization Theory
- PADM 5415 Strategic Management in the Public Sector
- PADM 5416 Budgetary Management for the Public Sector
- PADM 5472 Policy Seminar (Public Management)
- PADM 5613 Science, Risk and Evaluation
- PADM 5812 Governance in Developing Countries
- PADM 5813 The Evolution of World Bank/IMF Policy
- PADM 5814 Program and Project Management
- PADM 5816 Program Evaluation in Developing Countries

Other PADM courses as approved by the M.A. Supervisor.

### Public Management

Students must complete:

1. 0.5 credit in required course PADM 5117 Public Management
2. 2.5 credits electives from the following list:
  - PADM 5411 Organization Theory
  - PADM 5412 Ethics and Accountability in the Public Sector
  - PADM 5413 Law of Public Authorities I
  - PADM 5414 Law of Public Authorities II
  - PADM 5415 Strategic Management in the Public Sector
  - PADM 5416 Budgetary Management for the Public Sector
  - PADM 5417 Principles of Finance
  - PADM 5418 Human Resources Management
  - PADM 5419 Industrial Relations and Public Sector Collective Bargaining
  - PADM 5420 Policy and Program Evaluation
  - PADM 5421 Globalizing Public Management
  - PADM 5422 Urban and Local Government
  - PADM 5423 Third Sector Governance and Management
  - PADM 5472 Policy Seminar (Public Management)

Other PADM courses as approved by the M.A. Supervisor.

### Sustainable Development

Students must complete 3.0 credits in:

1. 0.5 credit in required course PADM 5112 Macroeconomics for Policy Analysis
2. 2.5 credits electives from the following list:
  - PADM 5611 Science and Technology Policies
  - PADM 5612 Industrial Policy, Innovation and Sustainable Production
  - PADM 5613 Science, Risk and Evaluation
  - PADM 5614 Natural Resource Management
  - PADM 5615 Politics and Policy of Energy in Canada
  - PADM 5616 Environmental Policy
  - PADM 5617 Implementing Sustainable Development in Industrialized Countries
  - PADM 5618 Environmental and Ecological Economics
  - PADM 5619 Urban Sustainability

- PADM 5620 The Science, Politics and Economics of Global Climate Change
- PADM 5672 Policy Seminar (Innovation, Science and Environment)
- PADM 5220 Regulation and Public Policy

Other PADM courses as approved by the M.A. Supervisor.

### Health Policy

Students must complete 3.0 credits in:

1. 1.0 credit in required courses:
  - PADM 5111 Microeconomics for Policy Analysis
  - PADM 5116 Policy Analysis and Contemporary Governance
2. 1.5 credits electives from the following list:
  - PADM 5221 Health Policy in Canada
  - PADM 5222 Economics and Health Policy
  - PADM 5229 The Health of Populations
  - PADM 5817 Health Policy in Developing Countries
3. 0.5 credit in other PADM courses as approved by the M.A. Supervisor.



# Religion and Public Life

College of the Humanities  
2A39 Paterson Hall  
613-520-2100  
carleton.ca/chum/religion

- M.A. Religion and Public Life

## M.A. Religion and Public Life

### About the Program

The MA in Religion and Public Life focuses on the study of social and political aspects of religion from the comparative, historical and contemporary perspectives. The study of both religion and public life will be approached from domestic and international vantage points. As such, while the degree focuses on religion, it has an inherent interdisciplinary approach to this topic. For a more detailed description of faculty members' areas of research and supervision, please see the departmental website.

### Academic Regulations

See the General Regulations section of this Calendar.

A grade of B- or better must normally be obtained in each course credited towards the master's degree. Please refer to Section 11.2 of the General Regulations.

### Admission Requirements

The normal requirement for admission to the Master's program is a BA Honours (or equivalent) in Religion/Religious Studies or a cognate discipline, with a High Honours standing (normally at least B+).

Students without a prior Method and Theory course in Religious Studies are required to complete RELI 4740 (Theory and Method).

Possession of the minimum entrance standing is not in itself, however, an assurance of admission into the program.

**Qualifying Year:** Applicants who do not qualify for direct admission to the Master's program may be admitted to a qualifying-year program designed to raise their status to that of honours graduates in Religious Studies. Applicants who lack an Honours degree but have a three-year degree with honours standing (at least B overall) will normally be admitted to a qualifying-year program. Please refer to the section 2.3 of the General Regulations. Students are expected to achieve a B+ average or better in the qualifying-year program in order to qualify for admission to the Master's year.

Qualifying-year students should consult the Undergraduate Calendar and the departmental website for a listing of 4000-level courses.

### Program Requirements

Students must complete 4.5 credits, consisting of the following:

- 0.5 credit in RELI 5801 Seminar in the Discipline
- 0.5 credit in RELI 5802 Seminar in Religion and Public Life
- 0.5 credit in RELI 5780 Graduate Research Seminar
- 1.5 credits in RELI 5908 Research Essay
- 1.5 credits at the 5000-level chosen with the

approval of the Graduate Program Coordinator. A selection of 5000-level thematic elective seminars in the study of Religion and Public Life are offered each year (RELI 5850, RELI 5851, RELI 5852).

Specific content of thematic elective courses reflects the interests and expertise of the instructor. Please refer to current course descriptions for more detailed information.

With the approval of the Graduate Studies Coordinator, a maximum of 1.0 credit may be selected from courses offered at the 4000-level, or in a related field, or at another university.

Each year, the Religion program offers 4000-level undergraduate 0.5-credit courses, which are open to students in the qualifying year and, with permission, to students in the M.A. program. Consult the Undergraduate Calendar for course information.

### Guidelines for Completion of Master's Degree

Full-time students enrolled in the 4.5-credit M.A. program are expected to complete RELI 5801 and RELI 5802 in the first term of study and RELI 5780 in the second term of study.

RELI 5908 Research Essay should be submitted by end of the Summer Study Semester. All elective coursework should be completed by the end of the second term of study.

Full-time students are required to file with the Graduate Studies Coordinator a detailed proposal of their Research Essay by the end of the second term of study. Part-time students must submit a detailed proposal of their Research Essay by the end of the term in which they are registered for RELI 5780.

The program is designed to be completed in a three term academic year.

Part-time students enrolled in the 4.5 credit M.A. program are expected to complete the required core courses (RELI 5801, RELI 5802 and RELI 5780) by the end of the third year of study. The Research Essay and all course work must be complete by the end of the sixth year of study.

## Social Work

School of Social Work  
509 Dunton Tower  
Tel.: 613-520-5601  
Fax: 613- 520-7496  
carleton.ca/socialwork

- Master of Social Work

### Master of Social Work

#### About the Program

The Master of Social Work program is based on an analytical and critical approach to social work practice, and to knowledge related to practice. The program examines the structural context of personal and social problems and of social work practice itself. The structural context refers to the interaction between individuals and the social, political, and economic dimensions of society. The program focuses on the development of social work practices that change the interactions between people and structural contexts.

The curriculum is organized into two concentrations:

1. Social Practices, which includes direct intervention with individuals, families, small groups, and communities; and
2. Social Welfare, which examines the political, economic, and social context within which social policy is made.

#### Academic Regulations

See the General Regulations section of this Calendar.

Candidates for the M.S.W. degree must complete all course work (or the equivalent) counted towards the degree with a grade of B- or higher. The School of Social Work does not permit the C+ option.

#### Admission Requirements

The School of Social Work provides two points of entry into the Master of Social Work program.

Applications are accepted to the first year of a two year M.S.W. program from candidates who hold an Honours bachelor's degree, or the equivalent, with at least high honours standing (normally B+ or higher in honours subject; B- or higher overall) in a discipline other than social work.

Applications are accepted to the one year M.S.W. program from candidates who hold an accredited Bachelor of Social Work degree with honours standing (normally B+ or higher in honours subject; B- or higher overall)

Applications are accepted to the one year M.S.W. program from candidates who are in the final year of a Bachelor of Social Work program, and who have maintained a B+ or higher in social work and B- or higher overall. Applicants with social work experience who hold undergraduate or graduate applied social science degrees from a university or other degree granting institution are directed to apply to the two year M.S.W. program. The School will review the equivalence of such degrees to a Bachelor of Social Work.

Work experience in social work or a related field is considered as one of several selection criteria for both M.S.W. Year I and M.S.W. Year II.

Persons who have a Bachelor of Arts degree and human service experience may also wish to apply to the Bachelor of Social Work program. Please refer to the Undergraduate Calendar for further information.

Applicants must have completed 1.0 credit in research methods in their undergraduate program. The School of Social Work will not normally grant advanced standing for course work completed prior to entry into the M.S.W. program. Students accepted into M.S.W. Year I will be expected to complete 5.0 credits of course work in Year I and 6.0 credits of course work in Year II. Students accepted into M.S.W. Year II will be expected to complete 6.0 credits of course work. Work experience may not be substituted for research or other academic requirements, including the practicum.

#### Program Requirements

Students with an Honours undergraduate degree other than a B.S.W. or the equivalent who are admitted into the two-year M.S.W. program must complete Year I and Year II.

Students with a B.S.W. or equivalent who are admitted into the one-year M.S.W. program must complete Year II.

Year I of the M.S.W. consists of the following 5.0 credits:

- SOWK 5308 [0.5 credit]
- SOWK 5408 [0.5 credit]
- SOWK 5608 [0.5 credit]
- SOWK 5501 [0.5 credit]
- SOWK 5502 [0.5 credit]
- SOWK 5606 [2.0 credits]
- 0.5 credit to be taken from graduate-level course offerings in the School.

Year II of the M.S.W. consists of the following 6.0 credits:

- SOWK 5306 or SOWK 5307
- SOWK 5405

And one of the following two options:

#### Thesis/Course Work Option

- SOWK 5909 [2.0 credits] Thesis
- 2.0 credits of course work

#### Practicum/Course Work Option:

- SOWK 5607 [2.0 credits] Practicum
- 2.0 credits of course work

For all course options listed above, a minimum of 1.0 credit must be taken from graduate-level course offerings, in the School of Social Work, a maximum of 1.0 credit may be taken outside the School of Social Work, and a maximum of 0.5 credit may be taken at the 4000-level.

All students in SOWK 5903, SOWK 5909, SOWK 5606, SOWK 5607 must maintain continuous registration until completion of the course in accordance with the General Regulations as stated in this calendar.

#### Part-Time Studies

The School offers part-time studies to a limited number of qualified candidates who cannot participate in a program of full-time study. The requirements for part-time studies are identical to those of the regular program, except that part-time students are limited to a maximum of 1.0 credit of course work per term.

Students registered on a part-time basis must maintain continuous registration for a minimum of two terms per year until all course requirements are completed.

In their first fall term, part-time students in the M.S.W. Year I must register in SOWK 5501 or SOWK 5502 and one of SOWK 5308, SOWK 5408, or SOWK 5608. Part-time students in the M.S.W. year II register in SOWK 5306 or SOWK 5307 plus an additional 0.5 credit of course work in their first fall term.

**Change of Status**

Students contemplating changing their full-time or part-time status should consult the General Regulations section of this Calendar.

## Sociology

Loeb Building B742  
Tel.: 613-520-2582  
Fax: 613-520-4062  
carleton.ca/socanth

- M.A. Sociology
- Ph.D. Sociology
- Ph.D. Sociology with Specialization in Political Economy (Specialization requirements listed under Political Economy)

### M.A. Sociology

#### About the Program

The principal focus of the graduate programs in sociology is the organization and development of contemporary societies in comparative context and with particular reference to Canadian society. The programs specialize in four fields: theory and methodology, stratification and power, cultural studies, and applied social research. See the department website for detailed descriptions of the fields and the variety of sub-fields sub-subsumed under these four areas. In addition, the Master of Arts in Sociology offers a concentration in quantitative methodology. The department strives to achieve a blend of research and formal graduate instruction in its graduate programs.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Academic Standing

A grade of B- or better must normally be obtained in each credit counted toward the master's degree. With the recommendation of the department, and permission of the Dean of the Faculty of Graduate Studies and Research, a candidate may be allowed a grade of C+ in 1.0 credit.

#### Admission Requirements

The requirement for admission into the master's program is a B.A.(Honours) (or the equivalent) with at least high honours standing in sociology or a closely-related field. Where relevant, previous professional experience will be taken into account in determining an applicant's standing on admission.

Applicants with general (three-year) bachelor's degrees may be admitted into a qualifying-year program designed to raise their standing to honours status. Students earning at least high honours standing in their qualifying-year courses will be considered for admission into the master's program. Refer to the General Regulations section of this Calendar for details of the regulations governing the qualifying year.

#### Program Requirements

Master's students in sociology are required to select and follow one of the optional program patterns below, chosen in consultation with a graduate adviser:

#### Thesis Program

5.0 credits including:

- 3.0 credits. Under certain circumstances one of the courses may be selected from those offered at the senior undergraduate level. SOCI 5005 and SOCI 5809 are highly recommended, especially for students who at the time of registration have not decided on a thesis topic;
- A thesis equivalent to 2.0 credits; and
- An oral examination on the candidate's thesis and program.

#### Research Essay Program

5.0 credits including:

- 4.0 credits. Under certain circumstances one of the courses may be selected from those offered at the senior undergraduate level. SOCI 5809, is highly recommended, especially for students who at the time of initial registration have not decided on a research topic;
- A research essay equivalent to 1.0 credit; and
- An oral examination on the candidate's research essay and program.

#### Course Work Program

- 5.0 credits excluding SOCI 5905. Under certain circumstances one of the courses may be selected from those offered at the senior undergraduate level; and
- Written and oral comprehensive examination in the candidate's area of specialization and program.

#### Concentration in Quantitative Methodology

Students in either the research essay or thesis program options may pursue a concentration in quantitative methodology. For a concentration in quantitative methodology, courses selected must include the following:

- SOCI 5005;
- SOCI 5809;
- At least 1.0 credit selected from: SOCI 5101, SOCI 5102, SOCI 5103 SOCI 5104, SOCI 5105, SOCI 5201 SOCI 5605; and
- At least 1.0 credit in sociology at the graduate level (not including those listed above).

Students in the Concentration in Quantitative Methodology may apply for admission into a Cooperative Education option. This option provides an opportunity for students to enhance their educational experience through a work placement directly related to their area of interest and expertise. Once admitted into this option, students shall enrol in SOCI 5907. The conditions of the placement are arranged with the student's supervisor and the graduate coordinator. Grades for the cooperative education placement are assigned in consultation between the placement supervisor and the graduate coordinator. Placements can be held for up to two academic terms and count for 1.0 credit.

#### Transfer from Thesis to Course Work M.A.

Students who choose to change from the thesis to the course work program must normally do so before registering for a third term after initial, full-time registration, or before registering for a fifth term after initial part-time registration.

### Ph.D. Sociology

#### About the Program

The principal focus of the graduate programs in sociology is the organization and development of contemporary societies in comparative context and with particular reference to Canadian society. The programs specialize in four fields: theory and methodology, stratification and power, cultural studies, and applied social research. See the department website for detailed descriptions of the fields and the variety of sub-fields sub-subsumed under these four areas.

The substantive focus of the Ph.D. program is the organization and development of contemporary societies, both in a comparative context and with particular reference to Canadian society.



The Ph.D. program in sociology normally will be undertaken on a full-time basis; however in exceptional cases the department will consider admission on a part-time basis.

#### Academic Regulations

See the General Regulations section of this Calendar.

Candidates must obtain a grade of B- or better in each credit, and Satisfactory on the comprehensive examinations, the Ph.D. thesis and its oral defence.

#### Admission Requirements

The minimum requirement for admission into the Ph.D. program is a master's degree (or the equivalent) in sociology, normally with a minimum average of B+ in courses (including the thesis where applicable), and with no grade below B

Applicants who have deficiencies in certain areas may be admitted to the Ph.D. program, but will normally be required to complete additional course work.

#### Program Requirements

Ten credits, including:

- SOCI 6000, and a thesis equivalent to a maximum of 7.0 credits or a minimum of 5.0 credits;
- Written and oral comprehensive examinations in two areas of specialization;
- Presentation of a thesis proposal;
- Language requirements as stated below; and
- An oral defence of the thesis.

#### Comprehensive Examinations

Each Ph.D. candidate is required to write comprehensive examinations in two of the following areas:

- Theory and Methodology
- Stratification and Power
- Cultural Studies
- Applied Social Research

Subjects of instruction and research subsumed under these four areas are:

#### Theory and Methodology

- Logic of Social Scientific Inquiry
- Classical Social Theories
- Contemporary Social Theories
- Feminist Theories
- Research Methods (Historical, Qualitative, and Quantitative)

#### Stratification and Power

- Occupations, Organizations, and the Labour Process
- Class Analysis and Social Stratification
- Political Sociology
- Race and Ethnic Relations
- Gender Relations
- Political Economy
- Canadian Society
- Social and Economic Development
- Citizenship Studies
- Governance, Regulation, and Law

#### Cultural Studies

- Communication and Popular Cultures
- Ethnographic Analysis
- Discourse Analysis
- Social Anthropology
- Social and Virtual Spaces

#### Applied Social Research

- Criminal Justice
- Health and Illness Policy
- Population Studies
- Sociology of Language
- Built Environments
- Education Policy

Upon petition to the sociology graduate program's coordinator, an approved field in sociology or a related discipline may be substituted for one of the options above. The subjects of instruction and research subsumed under each of the areas are indicative, and may be subsumed under more than one area, depending on the analytic approach adopted.

The comprehensive examinations are to be completed after course requirements for the Ph.D. have been completed. Comprehensive examinations must be completed no later than two years or six terms after initial full-time registration, and four years or twelve terms after initial part-time registration.

The thesis proposal is to be presented after comprehensive requirements have been completed. Normally the thesis proposal must be presented no later than two and one-half years or seven terms after initial full-time registration and five years or fifteen terms after initial part-time registration.

#### Language Requirement

The Department of Sociology and Anthropology requires each Ph.D. candidate to demonstrate an understanding of a language other than English. Although French is the preferred second language, students may be permitted to substitute another language if it is demonstrably relevant to their professional interests. It is strongly advised, however, that all English-speaking candidates be proficient in French. The language requirements may be satisfied by a demonstration of reasonable understanding, on sight, of material contained in selected samples of sociological literature in that language. Students may find it necessary or advisable to take a course in the required language before undertaking the departmental language examination.

## Sustainable Energy

Graduate Committee on Sustainable Energy

3034 Minto Centre

613-520-5659

carleton.ca/sustainable-energy

- M.A. Sustainable Energy
- M.A.Sc. Sustainable Energy
- M.Eng. Sustainable Energy

### M.A. Sustainable Energy

#### About the Program

The Master's program in Sustainable Energy involves advanced learning across engineering and public policy. Students will specialize in either the engineering or the policy side of the program, graduating with either an engineering degree (M.A.Sc. or M.Eng. in Sustainable Energy) or a public-policy degree (M.A. in Sustainable Energy). While specializing in either side of the program, students will also take courses that engage with the other disciplinary component. Students across the program will learn together, garnering an understanding of sustainable-energy problems in a setting of interdisciplinary collaboration.

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Academic Standing

A grade of B- or better must be obtained in each course counted towards the master's degree.

#### Full-time Continuation

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after two terms of full-time study (or equivalent), or if they receive a grade of less than B- in any two courses they have registered in.

#### Part-time continuation

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after completing 2.0 credits, or if they receive a grade of less than B- in any two courses they have registered in.

#### Admission Requirements

Applicants must have a bachelor's degree (or equivalent), with an average of B+ or higher. The level of academic performance and potential demonstrated within the degree is more important than the discipline; students may enter the program from a wide variety of academic backgrounds in the social sciences, humanities, sciences and engineering. Mid-career applicants who do not have a bachelor's degree, but who have demonstrated professional excellence over a number of years of work in the public sector will also be considered.

All applicants must have completed 1.0 credit in university-level micro- and macroeconomic theory (ECON 1000 or the equivalent)

0.5 credit in PSCI at the 2000-level or higher, dealing with institutions and processes by which governments legitimize and exercise power, ideally in a Canadian setting (PSCI 2003 or equivalent).

A working knowledge of algebra is also expected.

In some cases, applicants may be admitted to the program despite not having completed one of these prerequisite courses in economics or political science, on the condition that the course be completed with a

grade of B- or higher in the first year of the program. It is strongly recommended that students complete the prerequisites before starting the program, to ensure that their progress through the core courses is unimpeded.

Students whose first language is not English or who have not completed a previous degree at an English speaking university must demonstrate an adequate command of English by attaining, at least, a TOEFL score of 237 CBT (computer-based test) or 580 (written); or 86 IBT overall with a minimum score in each component of: writing: 22; speaking: 22; reading: 20; and listening: 20, or a CAEL score of 70, or an IELTS score of 7.0.

#### Program Requirements

Five (5.0) credits as follows:

- 0.5 credit in SERG 5000 Cross Disciplinary Course in Sustainable Energy
- 0.5 credit in SERG 5002 Sustainable Energy Engineering for Policy Students
- 0.0 credit in SERG 5800 Sustainable Energy Seminar Course
- 0.5 credit in PADM 5510 Energy Economics
- 0.5 credit in PADM 5116 Policy Analysis and Contemporary Governance
- 0.5 credit in PADM 5515 Sustainable Energy Policy or PADM 5615 Politics and Policy of Energy in Canada
- 1.5 credit selected from the Sustainable Energy Policy program field listed below
- 1.0 credit from graduate level courses offered by the School of Public Policy and Administration

#### Notes:

1. Courses must be appropriate to the student's qualifications and selected with the approval of the student's program supervisor.
2. Only a selection of courses listed is given in a particular academic year.

#### Courses

##### Sustainable Energy Policy Field

PADM 5511	Energy Management
PADM 5512	International Politics of Sustainable Energy
PADM 5572	Policy Seminar (Sustainable Energy)
PADM 5611	Science and Technology Policies
PADM 5612	Industrial Policy, Innovation and Sustainable Development
PADM 5613	Science, Risk and Evaluation
PADM 5614	Natural Resource Management
PADM 5616	Environmental Policy
PADM 5617	Implementing Sustainable Development in Industrialized Countries
PADM 5618	Environmental and Ecological Economics
PADM 5619	Urban Sustainability
PADM 5620	Science, Economics and Politics of Global Climate Change
PADM 5908	MA Research Essay (1.0 credit)
PADM 5909	MA Thesis (2.0 credits)
SERG 5906	Directed Study in Sustainable Energy

Other courses as approved by the MA supervisor.

**Co-op Option for M.A. in Sustainable Energy Policy**

A co-op option is available to full-time students in the M.A. program. Students admitted to this option must satisfactorily complete at least two work terms in order to graduate with a co-op designation on their transcripts and diplomas. These work terms are four months in duration and locate students in government departments or other organizations in order to work at a junior officer level. They provide students with opportunities to integrate the theoretical and practical aspects of public administration. During a work term, students will register in one of the co-op work term courses: PADM 5301, PADM 5302, or PADM 5303. While on a work term, students are limited to an additional 0.5 credit course. It should be noted that most co-op positions in the federal public service are restricted to Canadian citizens.

**M.A.Sc. Sustainable Energy****About the Program**

The Master's program in Sustainable Energy involves advanced learning across engineering and public policy. Students will specialize in either the engineering or the policy side of the program, graduating with either an engineering degree (M.A.Sc. or M.Eng. in Sustainable Energy) or a public-policy degree (M.A. in Sustainable Energy). While specializing in either side of the program, students will also take courses that engage with the other disciplinary component. Students across the program will learn together, garnering an understanding of sustainable-energy problems in a setting of interdisciplinary collaboration.

**Academic Regulations**

See the General Regulations section of this Calendar.

**Academic Standing**

A grade of B- or better must be obtained in each course counted towards the master's degree.

**Full-time Continuation**

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after two terms of full-time study (or equivalent), or if they receive a grade of less than B- in any two courses they have registered in.

**Part-time Continuation**

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after completing 2.0 credits, or if they receive a grade of less than B- in any two courses they have registered in.

**Admission Requirements**

Applicants must have a bachelor's degree (or equivalent) in a discipline relevant to engineering disciplinary foundations.

Normally, an average of B+ or higher is required for admission.

**Program Requirements**

Five (5.0) credits as follows:

- 0.5 credit in SERG 5000 Cross Disciplinary Course in Sustainable Energy
- 0.5 credit in SERG 5001 Sustainable Energy Policy for Engineers
- 0.0 credit in SERG 5800 Sustainable Energy Seminar Course

- 1.0 credit in courses from the Mechanical Energy Conversion or Efficient Electrical Energy Systems fields listed below
- 1.0 credit from graduate-level courses offered in the Faculty of Engineering and Design
- 2.0 credits in M.A.Sc. thesis (MECH 5909/SYSC 5909/ELEC 5909)

**M. Eng. Sustainable Energy****About the Program**

The Master's program in Sustainable Energy involves advanced learning across engineering and public policy. Students will specialize in either the engineering or the policy side of the program, graduating with either an engineering degree (M.A.Sc. or M.Eng. in Sustainable Energy) or a public-policy degree (M.A. in Sustainable Energy). While specializing in either side of the program, students will also take courses that engage with the other disciplinary component. Students across the program will learn together, garnering an understanding of sustainable-energy problems in a setting of interdisciplinary collaboration.

**Academic Regulations**

See the General Regulations section of this Calendar.

**Academic Standing**

A grade of B- or better must be obtained in each course counted towards the master's degree.

**Full-time Continuation**

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after two terms of full-time study (or equivalent), or if they receive a grade of less than B- in any two courses they have registered in.

**Part-time Continuation**

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after completing 2.0 credits, or if they receive a grade of less than B- in any two courses they have registered in.

**Admission Requirements**

Applicants must have a bachelor's degree (or equivalent) in a discipline relevant to engineering disciplinary foundations.

Normally, an average of B+ or higher is required for admission.

**Program Requirements**

Five (5.0) credits as follows:

- 0.5 credit in SERG 5000 Cross-Disciplinary Course in Sustainable Energy
- 0.5 credit in SERG 5001 Sustainable Energy Policy for Engineers
- 0.0 credit in SERG 5800 Sustainable Energy Seminar Course
- 1.0 credit in courses from the Mechanical Energy Conversion or Efficient Electrical Energy Systems fields listed below
- 3.0 credits from graduate-level courses offered in the Faculty of Engineering and Design

## Technology Innovation Management

Department of Systems and Computer Engineering (TIM)  
Mackenzie Bldg. 4456  
Tel.: 613-520-5740  
carleton.ca/tim

- M.A.Sc. Technology Innovation Management
- M.Eng. Technology Innovation Management

### M.A.Sc., M.Eng. Technology Innovation Management

#### About the Program

The objective of this program is to train engineers and computer scientists to become competent and efficient managers of the engineering processes that deliver innovative telecommunications systems, products, and services. The emphasis is on design, development, manufacture, and technical support, areas for which engineers are normally responsible and where their technical expertise and practical knowledge are critical.

The program focuses on research in the synthesis between communication systems engineering and management of engineering processes. Within this context the following areas receive major attention: Management of Engineering Processes, Network Design, Protocols and Performance, Software Engineering, Wireless and Satellite Communications, Manufacturing Systems Analysis .

#### Academic Regulations

See the General Regulations section of this Calendar.

#### Admission Requirements

The normal requirement for admission to the master's program is a bachelor's degree in electrical engineering, computer science or a related discipline, with at least high honours standing.

Candidates are required to have two years experience in technical work in telecommunications prior to admission.

Candidates applying for admission with degrees not in the discipline of engineering will be considered by the admissions committee. The committee is responsible for establishing criteria for degree equivalencies.

#### Program Requirements

Subject to the approval of the admissions committee, students in the master's program may choose to complete the degree by successfully completing either a thesis or a project.

#### M.A.Sc. - Master's Degree by Thesis

All master's students in the thesis option are required to complete a total of 5.5 credits as follows:

- 1.5 compulsory credits including: TTMG 5001; TTMG 5002; and TTMG 5003
- 2.0 approved credits from the list of restricted elective courses below
- a thesis equivalent to 2.0 credits

#### M.Eng. - Master's Degree by Project

All master's students in the project option are required to complete a total of 5.5 credits of which at least 5.0 must be at the 5000-level or above, as follows:

- 1.5 compulsory credits including: TTMG 5001; TTMG 5002; and TTMG 5003

- 2.0 approved credits from the list of restricted elective courses below
- 1.0 credit of approved non-restricted electives
- a graduate project equivalent to 1.0 credit

#### Restricted Elective Courses

Students in the master's program must complete 1.0 credit in the field of management of engineering processes and 1.0 credit in communication systems engineering. Courses in each of the four sub-fields and the field of management of engineering processes are listed below.

The sub-fields in communication systems engineering are:

- Software Engineering
- Wireless and Satellite Communications
- Network Design, Protocols and Performance
- Manufacturing Systems Analysis

All courses in the field of communication systems engineering are offered by the Department of Systems and Computer Engineering and begin with the prefix SYSC.

#### Communication Systems Engineering

##### Software Engineering

SYSC 5007, SYSC 5101, SYSC 5301, SYSC 5503, SYSC 5701, SYSC 5703, SYSC 5704, SYSC 5706, SYSC 5707, SYSC 5709, SYSC 5802

##### Wireless and Satellite Communications

SYSC 5503, SYSC 5504, SYSC 5606, SYSC 5608

##### Network Design, Protocols and Performance

SYSC 5001, SYSC 5004, SYSC 5005, SYSC 5007, SYSC 5101, SYSC 5109, SYSC 5201, SYSC 5207, SYSC 5503, SYSC 5607, SYSC 5706, SYSC 5801, SYSC 5808

##### Manufacturing Systems Analysis

SYSC 5001, SYSC 5004, SYSC 5802, EAJC 5207

##### Management of Engineering Processes

TTMG 5004, TTMG 5005, TTMG 5006, TTMG 5008, TTMG 5100, TTMG 5101, TTMG 5102, TTMG 5103, TTMG 5104

#### Non-Restricted Elective Courses

All students in the project option of the master's program are required to complete 1.0 credit from those offered by the Department of Electronics, Department of Mechanical and Aerospace Engineering, Department of Systems and Computer Engineering, School of Industrial Design, or School of Computer Science.



## Women's and Gender Studies

Pauline Jewett Institute of Women's and Gender Studies  
1501 Dunton Tower  
Tel.: 613-520-6645  
carleton.ca/womensstudies

- M.A. Women's Studies

### M.A. Women's Studies

#### Academic Regulations

See the General Regulations section of this Calendar.

Academic standing of B- or higher must be obtained in each course counted towards the fulfillment of the degree requirements. Candidates must also maintain a CGPA of 9.0 or higher and achieve Satisfactory or better on the MA thesis and its oral defence.

#### Admission Requirements

The minimum requirement for admission to the MA program in Women's and Gender Studies is a BA Honours degree in Women's and Gender Studies or related areas with high honours standing. Students who have completed a degree with a significant focus on gender and gender-related coursework from disciplines including Sociology, History, English, Philosophy, Anthropology, Canadian Studies and Political Science, for example, will be considered for admission to the program. Applicants without the requisite background may be required to take a maximum of 2.0 credits from designated courses at the undergraduate level in Women's and Gender Studies in addition to their normal MA program requirements.

#### Qualifying Year Program

Applicants without a B.A. Honours degree in Women's and Gender Studies but who have a three year degree with a Women's and Gender Studies major, minor or a degree in a related discipline with a minimum average of B+ will be required to complete successfully a qualifying year of full-time study, before proceeding to apply to the Master's program. At this time, the Institute will determine the student's eligibility to enter the program.

#### Program Requirements

The MA degree in Women's and Gender Studies requires the satisfactory completion of 5.0 credits, distributed according to one of the following two options (students are not required to choose one option over the other until the end of the first year of study):

##### Option I: Course work + Thesis

2.0 credits of required course work:

- 1.0 credit in WGST 5905 [1.0]
- 0.5 credit in WGST 5906
- 0.5 credit in WGST 5907
- 1.0 credit of additional course work chosen from available elective courses (see below)
- 2.0 credits WGST 5909 [2.0] MA Thesis

##### Option II: Course work + Research Essay

- 2.0 credits of required course work:
- 1.0 credit in WGST 5905 [1.0]

- 0.5 credit in WGST 5906
- 0.5 credit in WGST 5907
- 2.0 credits of additional course work chosen from available elective courses (see below)
- 1.0 credit WGST 5908 [1.0] Research Essay

#### Elective courses

Electives may be taken from a selection of courses offered outside the program in a related discipline, subject to the approval of the Graduate Supervisor.

Elective courses may include but are not limited to:

- PHIL 5350, PHIL 5304, PHIL 5800, PHIL 5500
- HIST 6903, HIST 5708, HIST 5803, HIST 5804
- PADM 5213, PADM 5701
- PSYC 5001, PSYC 5201
- PSCI 6301, PSCI 5200, PSCI 5506, PSCI 5607, PSCI 5205
- SOCI 5809
- WGST 5000, WGST 5001

#### Progress through the program

The first year of study is essentially the same for all full-time students entering the program regardless of whether their intention is to pursue the thesis or the research essay option (a schedule for part-time students is outlined below): all full-time students will be expected to complete the core feminist theory and methodologies courses in the first year (typically WGST 5906 will be offered in the fall term and WGST 5907 in the winter); WGST 5905 ; and, a further 1.0 credit chosen from among those electives on offer that year.

At the end of the winter term of the first year of study, and in consultation with the Graduate Supervisor, full-time students will be required to declare their intention to pursue the thesis option or to complete additional courses and a research essay. The deadline for this decision will normally be in writing on or before April 1st. In the fall of the second year of study, all full-time students will be expected to submit a research proposal that has been approved by their thesis or research essay supervisor or committee. The deadline to submit the proposal is September 15. Students pursuing the research essay option will also be required to complete two additional half-course electives. Typically, these courses will be completed in the fall term of the second year. Students will be expected to maintain regular contact with their thesis/research essay supervisor throughout the year to ensure steady progress and a timely completion of their research and writing.



# Courses

## Accounting (ACCT)

### Sprott School of Business

ACCT 5001 [0.25 credit]

#### **Financial Accounting**

Fundamentals of financial accounting. Techniques used to measure business transactions, preparation of financial statements, recording and valuation of assets, liabilities and equities.

Precludes additional credit for BUSI 5004 (no longer offered).

ACCT 5002 [0.25 credit]

#### **Managerial Accounting**

Fundamentals of managerial accounting and control. Techniques for management decision-making, planning, and control including cost-volume-profit analysis, product costing, variance analysis, relevant costing, transfer pricing and the balanced scorecard. Precludes additional credit for BUSI 5005 (no longer offered).

Prerequisite: ACCT 5001.

ACCT 5011 [0.25 credit]

#### **Financial Statement Analysis**

A user-oriented approach to the study of financial statements. The role of the financial statements and the annual report in the financial reporting process, using ratio analysis to analyze firm performance and make forecasts of future performance.

Precludes additional credit for BUSI 5000 (no longer offered).

ACCT 5012 [0.25 credit]

#### **Performance Measurement and Control**

Efficacy and efficiency of corporate strategies. Design and use of performance measurement systems from an organizational integrated systems view. Balanced scorecard, activity-based management, and other performance measurement and control systems.

Precludes additional credit for BUSI 5000 (no longer offered).

ACCT 5013 [0.25 credit]

#### **Public Sector and NGO Accounting**

Governmental and NGO accounting principles, practices, and unique financial reporting requirements. Comparison with private sector financial reporting and performance evaluation.

ACCT 5014 [0.25 credit]

#### **Financial Corporate Governance and Accountability**

Corporate governance functions including management and controllership, boards of directors, auditors, security commissions and the control of enterprise-wide risk management. Historical development and evaluation of current practices, including Sarbanes Oxley and its implications.

ACCT 5020 [0.5 credit]

#### **Intermediate Financial Accounting**

Concepts, methods and uses of financial accounting information, including an in-depth examination of the preparation and analysis of the financial statements of publicly traded and privately owned entities.

Prerequisite: successful completion of ACCT 5001, ACCT 5002, FINA 5501 and FINA 5502.

ACCT 5021 [0.5 credit]

#### **Advanced Financial Accounting**

The preparation and analysis of advanced financial accounting topics including pensions, earnings per share, leases, business combinations, taxation and foreign currency.

Prerequisite: successful completion of ACCT 5020 and FINA 5502.

ACCT 5022 [0.5 credit]

#### **Intermediate Management Accounting**

Cost and managerial accounting topics in business decision making, including product and process costing, cost behavior analysis, differential costing, contribution margin analysis and decision analysis under uncertainty.

Prerequisite: successful completion of ACCT 5001, ACCT 5002, FINA 5501 and FINA 5502.

ACCT 5023 [0.5 credit]

#### **Advanced Management Accounting**

Advanced topics in cost and managerial accounting, including budgeting, capital budgeting, standard cost systems, transfer pricing and performance evaluation of managers, organizations and strategy implementation.

Prerequisite: successful completion of ACCT 5022, and FINA 5502.



## Anthropology (ANTH)

### Department of Sociology and Anthropology

ANTH 5004 [0.5 credit]

#### Ecological Anthropology

Anthropological approaches to the study of human environment relationships and to current problems of ecological degradation affecting native societies around the world.

ANTH 5106 [0.5 credit]

#### North American Indigenous Peoples

Selected issues in North American Indian, Inuit, and Métis ethnographic studies. Debates over social change, cultural autonomy, native rights, and government policy.

ANTH 5107 [0.5 credit]

#### Issues in North American Ethnohistory

Methodological and substantive problems in the history of North American indigenous peoples. Controversies concerning the impact of European penetration and colonial policies on inter-tribal relations, cultural identity, and other aspects of native life.

ANTH 5109 [0.5 credit]

#### Development, Dependency and Gender

Varieties of development and dependency theories, and feminist critiques of both, in analyzing gender relations in the Third and Fourth Worlds.

ANTH 5202 [0.5 credit]

#### The Anthropology of Underdevelopment

Analysis of theoretical and historically concrete issues in the study of variable economic systems ranging from domestic subsistence and peasant production to slavery and capital-dominated markets.

ANTH 5208 [0.5 credit]

#### Anthropology of Indigeneity

An international exploration of what it means to claim indigenesness within a variety of contexts. The cultural politics of indigenous status in relation to such issues as primitivism, memory and revivalism in modern nation-states and diasporic communities.

ANTH 5209 [0.5 credit]

#### Special Topics in the Anthropology of Africa

Topic varies from year to year, and will be announced in advance of the registration period.

ANTH 5210 [0.5 credit]

#### Special Topics in Indigenous Studies

Topic varies from year to year, and will be announced in advance of the registration period.

ANTH 5305 [0.5 credit]

#### Special Topics in Ethnography

Topic varies from year to year, and will be announced in advance of the registration period.

ANTH 5401 [0.5 credit]

#### Theories and Methods I

Theoretical and methodological debates in contemporary anthropology.

ANTH 5402 [0.5 credit]

#### Theories and Methods II

Theoretical and methodological debates in contemporary anthropology.

Prerequisite: ANTH 5401 or permission of the Department.

ANTH 5403 [0.5 credit]

#### Interpreting Symbols

Theoretical and methodological approaches to the anthropology of signs and symbols, including the internal workings of symbolic systems, and their relationship to other aspects of social life. (Also listed as RELI 5403.)

ANTH 5701 [0.5 credit]

#### Anthropology of Religion

Anthropological literature and theories on religion in light of current debates in anthropology.

ANTH 5704 [0.5 credit]

#### Anthropology of the Body, Health, Illness and Healing

Issues and applications in medical anthropology. Topics may include the sociocultural meanings inscribed on the body; cultural perceptions of the prevention, causes and treatment of illness; social dimensions of the illness experience; and the political economy of health.

ANTH 5706 [0.5 credit]

#### Contemporary Material Cultures

The study of material culture and its potential for addressing contemporary social and cultural conditions in a variety of local and transcultural contexts.

ANTH 5708 [0.5 credit]

#### Special Topics in Anthropology

Topic varies from year to year, and will be announced in advance of the registration period.

ANTH 5807 [0.5 credit]

#### Special Topics in Symbolism and Culture

Topic varies from year to year, and will be announced in advance of the registration period.

ANTH 5808 [0.5 credit]

#### Selected Topics in North American Native Studies

Topic varies from year to year. Students should check with the Department regarding the topic offered.

ANTH 5809 [0.5 credit]

#### Selected Topics in the Anthropology of Development and Underdevelopment

Topic varies from year to year. Students should check with the Department regarding the topic offered.

ANTH 5812 [0.5 credit]

#### Research Design

Design and methods of anthropological enquiry.

ANTH 5900 [0.5 credit]

#### Tutorial

ANTH 5906 [0.5 credit]

#### Fieldwork

Directed field research.

Prerequisite: permission of the Department.

ANTH 5907 [0.5 credit]

#### Placement in Anthropology

This course offers an opportunity to earn academic credit by engaging in research activities under the supervision of professional researchers in museums, government departments, non-governmental organizations, or other professional research settings. Placement research must be related to the preparation of the master's thesis.

Prerequisite: permission of the Department.

ANTH 5908 [1.0 credit]

#### M.A. Research Essay

Students will normally enrol in this course for a maximum of three consecutive terms of study, including one summer term. Students must normally enrol in this course not later than the beginning of the second full year of study.

ANTH 5909 [2.0 credits]

#### M.A. Thesis

## Graduate Courses - Anthropology (ANTH)

ANTH 6000 [1.0 credit]

**Doctoral Seminar: Theory and Method in Contemporary Anthropology**

An in-depth exploration of theory and method in contemporary socio-cultural anthropology with special emphasis on engaged anthropology. This course is required of all first year doctoral students in anthropology.

ANTH 6001 [0.5 credit]

**Selected Topics in Anthropology**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

ANTH 6002 [0.5 credit]

**Research Design**

Issues in the design and methods of anthropological inquiry, including proposal-writing, research ethics, and research funding. Required of all first-year Ph.D Anthropology students.

ANTH 6100 [0.0 credit]

**Thesis Writing Seminar**

This seminar will meet on a regular basis for students who are writing their doctoral theses to present draft chapters for constructive critical discussion. Normally required for all Ph.D. Anthropology students who have completed their doctoral research, until the completion of their theses.

ANTH 6900 [0.5 credit]

**Tutorial**

A tutorial is designed to permit students to pursue individual research on a relevant topic. Topics will be chosen in consultation with at least one faculty member, the student's supervisor, and the Anthropology graduate coordinator.

ANTH 6907 [0.5 credit]

**Placement in Anthropology**

This course offers an opportunity to earn academic credit by engaging in research activities under the supervision of professional researchers in museums, government departments, nongovernmental organizations, or other professional research settings. Placement research must be related to the preparation of the doctoral research.

ANTH 6909 [7.0 credits]

**Ph.D. Thesis**

## Applied Language and Discourse Studies (ALDS)

### School of Linguistics and Language Studies

ALDS 5001 [0.5 credit]

#### Directions in Applied Linguistics and Discourse Studies

A survey of current research directions in Applied Linguistics and Discourse Studies and an introduction to ongoing research in the School. The course introduces students to the scope of theory and practice in the field.

Precludes additional credit for LALS 5001 (no longer offered).

ALDS 5002 [0.5 credit]

#### Inquiry Strategies in Applied Linguistics and Discourse Studies

A consideration of various approaches to the design of studies and the collection and analysis of data. Naturalistic and quasi-experimental methods will be discussed. The role of statistics in disciplined inquiry, including an introduction to elementary procedures.

Precludes additional credit for LALS 5002 (no longer offered) and LALS 5502 (no longer offered).

ALDS 5005 [0.5 credit]

#### Theoretical Foundations for Applied Linguistics and Discourse Studies

Overview of the works of 20th and 21st-century theorists such as Bakhtin, Bourdieu, Burke, Foucault, Latour and Vygotsky.

Precludes additional credit for LALS 5005 (no longer offered).

ALDS 5102 [0.5 credit]

#### Systemic-Functional Linguistics

Functions of language in the exchange of meanings between people in a wide variety of communicative situations. Semantic and syntactic resources at risk in these different contexts. Interactions between language and the social context. Also offered at the undergraduate level with different requirements as ALDS 4709, for which additional credit is precluded.

Precludes additional credit for LALS 5102 and also LALS 5709 if taken prior to 2007-08. Prerequisite: restricted to graduate students in Applied Linguistics and Discourse Studies and Journalism and Communication.

ALDS 5103 [0.5 credit]

#### Major Structures of English

The structure of English language, highlighting important contrasts between English and other languages, and grammatical difficulties for ESL learners. Also offered at the undergraduate level, with different requirements as ALDS 4801, for which additional credit is precluded.

Precludes additional credit for LALS 5103 and also LALS 5801 if taken prior to 2007-08.

ALDS 5201 [0.5 credit]

#### The Language Classroom: Theory, Research and Practice

Theories of language instruction and learning in classroom settings; examination of empirical research on pedagogical principles and practices; hands-on investigation of classroom processes. Precludes additional credit for LALS 5201 (no longer offered).

ALDS 5202 [0.5 credit]

#### Curriculum in Language Teaching

Current theory and practice in language curriculum development and evaluation in the light of recent research in linguistics, sociolinguistics, language acquisition and language education policy.

Precludes additional credit for LALS 5202 (no longer offered).

ALDS 5203 [0.5 credit]

#### Issues in English Language Teaching/Teacher Education

A research seminar to explore current issues in English language teaching/teacher education.

Precludes additional credit for LALS 5203 (no longer offered).

ALDS 5204 [0.5 credit]

#### Seminar in University Teaching

Theoretical and empirical work related to teaching in higher education. Analysis of instructional discourse, use of language in classroom decision-making, bases of effective practice and methods of instruction. Constructivist principles of teaching and learning. Role of teaching in university scholarship. (Also offered as PSYC 6104.)

Precludes additional credit for LALS 5204 and LALS 5905 (Section W, 2000-01), LALS 5905 (Section X, 2001-02) and LALS 5905 (Section W, 2002-03).

ALDS 5205 [1.0 credit]

#### Teaching English as a Second Language: Methodology

Classification of classroom teaching methods and materials; adaptation of teaching materials for particular situations; creation of teaching materials; teaching techniques and strategies. Also offered at the undergraduate level, with different requirements, as ALDS 4205, for which additional credit is precluded. Must be taken concurrently with ALDS 5806.

Precludes additional credit for LALS 5205 (no longer offered).

ALDS 5207 [0.5 credit]

#### Pedagogical Grammar in Second and Foreign Language (SL/FL) Teaching

The concept of pedagogical grammar in SL/FL teaching. Critical examination of recent theories of 'focus on form' in communicative language classrooms, and related empirical work.

Precludes additional credit for LALS 5207, LALS 5905 (Summer 2002) and LALS 5603 (if taken prior to 2007-08).

ALDS 5208 [0.5 credit]

#### Languages for Specific Purposes (LSP)

Introduction to LSP, a sub-field of applied linguistics tailoring language instruction to specific groups of learners. Developments in strands of LSP (English for Science, Business, etc.). Research and teaching methodology. Emphasis on English for Academic Purposes/English for Specific Purposes research and instruction at Carleton.

Also offered at the undergraduate level with different requirements as ALDS 4208, for which additional credit is precluded.

Precludes additional credit for LALS 5208 (no longer offered).

ALDS 5301 [0.5 credit]

#### Language and Cognition

Structure and representation of linguistic knowledge in human cognition. Evidence from child language acquisition, language processing and language impairment. Also listed as CGSC 5003, for which additional credit is precluded.

Precludes additional credit for LALS 5301 (no longer offered).

ALDS 5302 [0.5 credit]

**Second Language Acquisition and Learning Theories**

Current social and cognitive theories of knowledge and learning and their application to the acquisition of first and additional languages; relation of theory to empirical studies of language learning in classroom and natural settings.

Precludes additional credit for LALS 5302 and LALS 5601 if taken prior to 2007-08.

ALDS 5303 [0.5 credit]

**Linguistic Analysis, Culture and Cognition**

Universals of language from a cross-cultural perspective. Study of lesser-known languages leading to critical understanding of universal human concepts and communication practices in culture-specific configurations. Cross-linguistic analysis as a means to general understanding of diversity and universality in human cognition.

Precludes additional credit for LALS 5303 (no longer offered).

ALDS 5404 [0.5 credit]

**Aspects of Bilingualism**

Linguistic, psycholinguistic and cultural issues in bilingualism and bilingual education.

Prerequisite: fourth-year courses in linguistics or permission of the School.

Precludes additional credit for LALS 5404 and LALS 5701 if taken prior to 2007-08.

ALDS 5407 [0.5 credit]

**Language Policy and Planning**

Interaction of political, social, and cultural factors in the planning and implementation of language policy in international contexts.

Prerequisite: fourth-year courses in linguistics or permission of the School.

Precludes additional credit for LALS 5407 and LALS 5707 if taken prior to 2007-08.

ALDS 5408 [0.5 credit]

**Critical Discourse Analysis**

Discourse in the structuring of social and cultural change and in a wide range of contexts such as the media and education.

Precludes additional credit for LALS 5408 and LALS 5708 (if taken prior to 2007-08).

ALDS 5409 [0.5 credit]

**Policy and Practice in Literacy and Language Education**

Regulation of literacy and language education programs and teaching through public discourse, government policy, and institutional accountability; institutional ethnography as a method for investigating this regulation.

Precludes additional credit for LALS 5409 and LALS 5704 if taken prior to 2007-08.

ALDS 5501 [0.5 credit]

**Language Testing and Assessment**

Issues in language testing and classroom assessment, including validity theory and current validation research; challenges in test development; washback; models of alternative assessment.

Precludes additional credit for LALS 5501 (no longer offered).

ALDS 5602 [0.5 credit]

**Features and Principles of Academic Discourse**

Examination of features and underlying principles of academic writing in various disciplines. Analysis of disciplinary texts in their particular social contexts.

Precludes additional credit for LALS 5602 and LALS 5905 (2001-02) and LALS 5406 (if taken prior to 2007-08).

ALDS 5605 [0.5 credit]

**Research and Theory in Workplace Writing**

Developments in the study of workplace writing from the 1970s, with a focus on recent work. Discussion of how writing is used in accomplishing work, what constitutes proficiency in workplace writing, and how novices learn to write in the workplace.

Precludes additional credit for LALS 5605 (no longer offered).

ALDS 5606 [0.5 credit]

**Adult Literacy Practices and Learning**

Studies of adult literacy practices within social organization and action, and examination of literacy learning through engagement in social action.

Precludes additional credit for LALS 5606 (no longer offered).

ALDS 5607 [0.5 credit]

**Research and Theory in Academic Writing**

Major developments in the study of academic writing from the 1970s, with a focus on recent work. Discussion of what academic writing entails, what constitutes proficiency in academic writing, and how instruction can help students develop their writing abilities.

Precludes additional credit for LALS 5607 and LALS 5605 if taken prior to 2007-08.

ALDS 5702 [0.5 credit]

**Qualitative Research Methodologies in Writing Studies**

Various qualitative methodologies employed for studying writing in school, workplace, and community. Examples may include case-study research, ethnography, discourse analysis, participatory action research, narrative analysis, mixed methods. Assumptions and principles underlying different methodologies.

Precludes additional credit for LALS 5702 (no longer offered).

ALDS 5703 [0.5 credit]

**Approaches to Genre Studies**

Major developments in the study of non-literary genres from the 1980s, with a focus on recent work. Consideration of genre as text-based social action.

Discussion of genre as a central concept and tool of analysis in Writing Studies and Discourse Studies. Precludes additional credit for LALS 5703 (no longer offered).

ALDS 5705 [0.5 credit]

**Second Language Writing: Research and Theory**

Second language writing: research, theory, and pedagogy.

Precludes additional credit for LALS 5705 (no longer offered).

ALDS 5706 [0.5 credit]

**Socio-Cultural Theories of Learning for Writing Studies**

Current socio-cultural theories of learning, such as situated learning, activity theory, and organizational learning. Consideration of the applications of these theories for empirical research on writing in academic and professional settings. Discussion of implications for writing pedagogy.

Precludes additional credit for LALS 5706 (no longer offered).

ALDS 5806 [0.5 credit]

**Practicum in Teaching English as a Second Language: Experience in an ESL Teaching Situation**

Integrates the academic dimension of the program with practical work. Observation in ESL classes and possible assistance with teaching materials or classes. Must be taken concurrently with ALDS 5205. Precludes additional credit for LALS 5806 and LALS 5206 if taken prior to 2007-08.



ALDS 5902 [0.5 credit]

**Tutorial in Applied Linguistics and Discourse Studies**

A one-term tutorial to study applications of linguistics in such areas as first-language education and second-language teaching.

ALDS 5903 [0.5 credit]

**Special Topics in the Teaching and Acquisition of Additional Languages**

Exploration of topics from current research into the teaching and acquisition of additional languages. Topic to be announced.

ALDS 5904 [0.5 credit]

**Special Topics in Written Discourse/Literacies**

Exploration of topics from current research into the nature, acquisition and teaching of written discourse/literacies. Topic to be announced.

ALDS 5905 [0.5 credit]

**Special Topics in Applied Linguistics and Discourse Studies**

Exploration of a topic from current research in Applied Linguistics and Discourse Studies. Topic to be announced.

ALDS 5907 [1.0 credit]

**Tutorial in Applied Linguistics and Discourse Studies**

A two-term tutorial to study applications of linguistics in such areas as first-language education and second-language teaching.

ALDS 5908 [1.0 credit]

**Research Essay**

ALDS 5909 [2.0 credits]

**M.A. Thesis**

ALDS 6101 [0.5 credit]

**Doctoral Core Seminar in Applied Linguistics and Discourse Studies, Part I**

Detailed examination of foundational texts, current theories, and research methodologies in Applied Linguistics and Discourse Studies.

ALDS 6102 [0.5 credit]

**Doctoral Core Seminar in Applied Linguistics and Discourse Studies, Part II**

Detailed examination of foundational texts, current theories, and research methodologies in Applied Linguistics and Discourse Studies.

ALDS 6105 [0.5 credit]

**Directed Readings in Applied Linguistics and Discourse Studies**

Research on a topic chosen in consultation with a faculty member and with the approval of the graduate supervisor.

ALDS 6109 [0.5 credit]

**Doctoral Project I**

The production of a proposal for the student's thesis research and the presentation of this work in a public forum.

ALDS 6201 [0.5 credit]

**Praxis in Applied Linguistics and Discourse Studies, Part I**

Field placement in an educational, workplace or community setting with guided reflective, theory-informed analysis of the field experience.

ALDS 6202 [0.5 credit]

**Praxis in Applied Linguistics and Discourse Studies, Part II**

Field placement in an educational, workplace or community setting with guided reflective, theory-informed analysis of the field experience.

ALDS 6209 [0.5 credit]

**Doctoral Project II**

A reflective, theory-informed presentation on the student's field experience.

ALDS 6301 [0.5 credit]

**Interpretive Analysis in Applied Linguistics and Discourse Studies**

A seminar on approaches to the analysis of research data and the presentation of results. Focus on the student's own data collection process and the analysis of this data. Depending on the on-going research of the students enrolled in the course, either or both qualitative and quantitative approaches will be emphasized.

ALDS 6309 [0.5 credit]

**Doctoral Project III**

A progress report on the student's thesis research, taking the form of a public talk, conference paper, or manuscript for submission to a journal.

ALDS 6909 [5.0 credits]

**Ph.D. Thesis**

This new course is required to support the new doctoral program, and follows the university norms for presentation and defence.

## Architecture (ARCH, ARCC, ARCU, ARCN, ARCS, ARCT)

### Azrieli School of Architecture and Urbanism

- Theory/History (ARCH)
- Technical (ARCC)
- Urban (ARCU)
- Techniques (ARCN)
- Design Studios/Design Thesis/Research (ARCS)
- M.A.S. Thesis (ARCT)

ARCH 5000 [0.5 credit]

#### Directed Studies in History and Theory of Architecture

Reading and research tutorials.

Prerequisite: permission of the School.

ARCH 5001 [0.5 credit]

#### Architecture Seminar I

An introduction to the intellectual frameworks connecting design and culture as manifest in theories of culture and architecture. The seminar builds on previous undergraduate studies, and is not an introduction to these fields. The field of inquiry is both historical and contemporary.

ARCH 5002 [0.5 credit]

#### Architecture Seminar II

A continuation of ARCH 5001, this seminar follows the same general description, but concentrates more on architectural design, on the contemporary condition, and on the ways of thinking that characterize embodiment of cultural content in architecture and other artifacts.

Prerequisite: ARCH 5001.

ARCH 5003 [0.5 credit]

#### Design and Culture Workshop

The prime objective of the workshop is to investigate cultural issues in architectural design. The workshop operates as a directed study with specific content, objectives, and scheduling arranged between student and academic advisor.

ARCH 5100 [0.5 credit]

#### Directed Studies in Architecture and Society

Reading and research tutorials.

Prerequisite: permission of the School.

ARCH 5101 [1.0 credit]

#### Colloquium I

This seminar brings together graduate students with architectural faculty to present their work-in-progress. It focuses on an immersion in conventions of theoretical and methodological approaches to advanced architectural research, including research ethics, proposal writing and research funding.

ARCH 5200 [0.5 credit]

#### Graduate Seminar I: Introduction to Critical Thought in Architecture

Critical theories and research approaches relevant to the field of architecture. Identification of issues through a coordinated series of lectures and readings. Development of analytical and interpretative skills through seminar discussions and writing culminating in a scholarly position paper by the student.

ARCH 5201 [0.5 credit]

#### Graduate Seminar 2: Contemporary Theoretical Perspectives in Architecture

Lectures, readings, and case studies on contemporary issues in architecture and allied fields of study. Critical analysis of trends and possibilities set against traditional modes of architectural thought and practice. This course serves as a forum for a preliminary articulation of the thesis proposal. Prerequisite: ARCH 5200.

ARCH 5301 [0.5 credit]

#### Seminar: Vitruvian Exercises I

Investigation of the cunning and graphic intelligence of architects: i.e. architectural modes of research.

ARCH 5302 [0.5 credit]

#### Seminar II: Vitruvian Exercises II

Seminar II builds upon the fall term with a focus on the study of the fabric of architectural theory stretched within the marble loom of construction. This course is required of all first year M.A.S. students.

ARCH 5402 [0.5 credit]

#### Evaluation of Heritage Properties

The cultural, political, economic and legal factors that shape our definition of heritage architecture. Processes for and implications of heritage designation, cultural value and costs associated with restoration and ongoing preservation. (Theory/History Elective)

Lectures, three hours a week.

ARCH 5600 [0.5 credit]

#### Housing and Culture Seminar

Housing as a function of social organization, demographics, market demand and governmental policies. The evolution of housing form, the role of the state, and the participation of architects in the housing marketplace promoting design as a form of social reform.

Precedes additional credit for ARCH 4201.

ARCH 5909 [2.0 credits]

#### M.Arch. Post-Professional Thesis (Architecture and Cultural Diversity)

A scholarly, written thesis supported by appropriate methods of two and three-dimensional representation. Research undertaken by the student is expected to engage one of the research topics outlined above. Proposals must be approved by the graduate committee of the Azrieli School of Architecture and Urbanism. Final thesis documentation must satisfy the requirements established by the Faculty of Graduate and Postdoctoral Affairs.

ARCH 6001 [0.5 credit]

#### Seminar: Vitruvian Exercises I

Investigation of the cunning and graphic intelligence of architects: i.e. architectural modes of research. This course is required of all first year doctoral students in architecture.

ARCH 6002 [0.5 credit]

#### Seminar II: Vitruvian Exercises II

Seminar II builds upon the fall term with a focus on the study of the fabric of architectural theory stretched within the marble loom of construction. This course is required of all first year doctoral students in architecture.

ARCH 6101 [1.0 credit]

#### Colloquium I

This seminar brings together doctoral students with architectural faculty to present their work-in-progress. Immersion in conventions of theoretical and methodological approaches to advanced architectural research, including research ethics, proposal writing and research funding. This course is required of all first year doctoral students in architecture.

ARCH 6102 [1.0 credit]

#### Colloquium II

This seminar continues to bring together doctoral students with architectural faculty and guest lecturers to present their work-in-progress. This course is required of all students enrolled in the Ph.D. program from the second year through until completion of the dissertation.

ARCH 6907 [1.0 credit]

**Ph.D. Comprehensive Examination**

Students must demonstrate to their thesis advisory committees a sufficiently broad background in the theoretical and topical area literatures and constructions relevant to their individual projects.

ARCH 6908 [1.0 credit]

**Ph.D. Proposal Examination**

Students must demonstrate to thesis advisory committees their ability to link theory to a work or practice of architecture. This examination requires the preparation of a drawing or a model, to then be discussed within a theoretical framework during the oral part of the exam.

ARCH 6909 [4.0 credits]

**Ph.D. Dissertation**

The dissertation will be comprised of two critical modes of investigation of equal importance: a speculative project and a research text. The speculative project is realized using specific traditional and non-traditional media as deemed appropriate.

• **Technical (ARCC)**

ARCC 5000 [0.5 credit]

**Directed Studies in Architecture and Technology**

Reading and research tutorials.

Prerequisite: permission of the School.

ARCC 5001 [0.5 credit]

**Introduction to Design and Multimedia**

Multimedia and interactive design as they relate to architecture and the field of design. Special topics include virtual environments, user interface in software, Web and product design, perceptual and cognitive science, navigation, film/video and sound editing and animation technologies.

ARCC 5002 [0.5 credit]

**Topics in Design and Multimedia: Information Architecture and the World Wide Web**

Introduction to the design of Web-based applications, focusing on process, site architecture, usability testing, and Web functionality. Students synthesize and customize software applications. Client and server-side functionality. Introduction to relational database design, JavaScript, cgi scripts, and «middleware» products such as WebObjects and ColdFusion.

ARCC 5003 [0.5 credit]

**Design and Technology Workshop**

The prime objective of the workshop is to investigate issues in architectural design in relation to technology as a cultural paradigm. The workshop operates as a directed study with specific content, objectives, and scheduling arranged between student and academic advisor.

ARCC 5096 [0.5 credit]

**Building Technology I**

Case studies of vernacular buildings from different climatic regions: issues of human comfort, construction, and materials. Site orientation, foundations, structure and envelope in terms of their response to local climate: sun (light and heat), wind, moisture. Final projects developed in conjunction with design studio.

ARCC 5097 [0.5 credit]

**Building Technology II**

Technical issues involved in architectural design of buildings from ancient times to the present. Technological innovation and materials related to structural developments, and the organization and design of structures. Basic concepts of equilibrium, and mechanics of materials. Final projects developed in conjunction with design studio.

ARCC 5098 [0.5 credit]

**Building Technology III**

Wood frame, post and beam, steel and concrete systems and construction techniques. Structural systems and building envelope principles and practice are explored in conjunction with mechanical and electrical systems in small buildings. Final projects developed in conjunction with design studio.

ARCC 5099 [0.5 credit]

**Building Technology IV**

Medium-scale steel and concrete structured buildings as case studies to explore approaches to site resources, building envelope, daylighting design, water supply, HVAC, electric lighting, room and environmental acoustics, fire protection, with focus on sustainable design strategies. Final projects developed in conjunction with design studio.

ARCC 5100 [0.5 credit]

**Advanced Building Systems**

Introduction to advanced design in building technology and systems integration. Leading edge building materials, technologies and philosophies will be explored through intensive case study research and analysis, comparing, and critically evaluating, traditional methods with current computer modeling and analysis techniques.

ARCC 5200 [0.5 credit]

**Professional Practice**

The practice of architecture. Professional organization and conduct, the architect's services, business law, office organization and management, contract documents, building codes, contract management, cost control, accounting and site supervision. Guest speakers and case studies.

Precludes additional credit for ARCU 4200.

ARCC 5401 [0.5 credit]

**Workshop: Technical Studies in Heritage Conservation**

Prerequisite: permission of the School.

ARCC 5909 [2.0 credits]

**M.Arch. Post-Professional Thesis (Design and Technology)**

Basic or applied research in architectural, industrial, and digital design. Areas include interactive education/training, product/interface design, programming/scripting, culture/technology, or research as defined by the student. Proposals must be approved by the Graduate Committee of the Azrieli School of Architecture and Urbanism. Final thesis documentation must satisfy the requirements established by the Faculty of Graduate Studies.

• **Techniques (ARCN)**

ARCN 5000 [0.5 credit]

**Directed Studies in Computer-Aided Design**

Reading and research tutorials.

Prerequisite: permission of the School.

ARCN 5001 [0.5 credit]

**Directed Studies in Architecture and Morphology**

Reading and research tutorials.

Prerequisite: permission of the School.

ARCN 5005 [0.5 credits]

**Theory and Practice of Architectural Representation**

Free-hand drawing as a way of observing and understanding the world. Various media and techniques introduced through a wide range of studio and outdoor exercises. (Theory/History Elective)

Graduate Courses - Architecture (ARCH, ARCC, ARCU, ARCN, ARCS, ARCT)

ARCN 5100 [0.5 credit]

**Representation and Documentation in Architectural Conservation**

An in-depth study of the conventions and history of heritage recording including traditional field survey, photogrammetry, laser scanning technologies, and hybrid representations.

Workshop, six hours a week (including field trips and on-site work).

ARCN 5101 [0.5 credit]

**Interactive Design Workshop I**

An intensive introduction to the design of interactive environments, using multimedia software including Adobe Photoshop, Illustrator, Premiere, Macromedia, Dreamweaver, Fireworks, Director, 3D Modeling programs, and sound editing. Basic design, graphic design, and software literacy. Presentations by design professionals.

ARCN 5102 [0.5 credit]

**Interactive Design Workshop II**

An introduction to the logistic aspects of producing multimedia products with an emphasis on usability testing and user interface design. Topics include: storyboarding and graphic design, instructional design, rapid prototyping, project streaming, management and marketing, technical writing and product evaluation. Organized as a seminar. Work is done in teams.

ARCN 5301 [0.5 credit]

**Workshop: Daedalic Exercises I**

Experimental mediation, materiality and making.

ARCN 5302 [0.5 credit]

**Workshop: Daedalic Exercises II**

Innovative mediation, materiality and making.

ARCN 5909 [2.0 credits]

**Thesis - Directed Research Studio (DRS)**

An intensive research-based design project. The unit is initiated and guided by a faculty member engaged in organized research. Proposals must be approved by the Graduate Committee of the Azrieli School of Architecture and Urbanism.

ARCN 6001 [0.5 credit]

**Workshop: Daedalic Exercises I**

Experimental mediation, materiality and making. This course is required of all first year doctoral students in architecture.

ARCN 6002 [0.5 credit]

**Workshop: Daedalic Exercises II**

Experimental mediation, materiality and making. This course is required of all first year doctoral students in architecture.

ARCN 6901 [0.5 credit]

**Placement in Architecture**

An opportunity to earn academic credit by engaging in research activities under the supervision of a professional architect or researcher in architectural, government, non-governmental or other professional settings. Placement research must be related to the preparation of the doctoral research.

• **Design Studios/Design Thesis/Research (ARCS)**

ARCS 5102 [1.5 credits]

**M.Arch. 1 - Studio I**

Sensory components of architecture: use, effect, and symbolic potential. Light, lighting, sound, sensation of heat and cold, and related phenomena studied in modest building proposals. Social considerations of architecture. The conventions of architectural drawing. Computer Modeling as a medium of architectural analysis, documentation, and presentation.

ARCS 5103 [1.5 credits]

**M.Arch. 1 - Studio II**

Building materials and practices within the context of increasingly complex building programs. Social context of architecture in relation to material expression. Modeling is stressed. (Core course)

ARCS 5104 [1.5 credits]

**M.Arch. 1 - Studio III**

A comprehensive studio dealing with issues of program and site as the culturally defining aspects of architectural practice within complex urban and social situations, using difficult sites and hybrid programs. Projects brought to a high degree of technical, formal, and graphic resolution. (Core Course)

ARCS 5105 [1.5 credit]

**Graduate Studio 1**

An architectural investigation within a contemporary urban setting, usually dealing with central-city sites and complex programs. Projects address the question of urban architecture both from practical and theoretical perspectives. Architecturally relevant building technology and systems will be introduced in the Studio as required.

ARCS 5106 [1.5 credit]

**Graduate Studio 2**

The design of a large-scale and culturally significant building project, set within a prominent urban or natural landscape. Integrated resolution of the combined issue of site, program, and expression is expected. Architecturally relevant building technology and systems will be introduced in the Studio as required.

Prerequisite: ARCS 5105.

ARCS 5909 [2.0 credits]

**Thesis - Independent Study**

Student-initiated design investigation, developed with a thesis supervisor, supported by text and appropriate methods of two and three-dimensional representation. Proposals must be approved by the Graduate Committee of the Azrieli School of Architecture and Urbanism.

• **M.A.S. Thesis (ARCT)**

ARCT 5909 [2.0 credits]

**M.A.S. Thesis**

A scholarly written thesis supported by methods of two and three-dimensional representation. Research undertaken by the student is expected to engage a topic in the culture of practice in Architecture. Proposals must be approved by the graduate committee of the Azrieli School of Architecture and Urbanism.

• **Urban (ARCU)**

ARCU 5000 [0.5 credit]

**Directed Studies in Architecture and the City**

Reading and research tutorials.

ARCU 5402 [0.5 credit]

**Workshop: Urban Studies in Heritage Conservation**

Prerequisite: permission of the School.



## Art History (ARTH)

### School for Studies in Art and Culture: Art History

ARTH 5010 [1.0 credit]

#### Art and Its Institutions

The institutions of art and art history, the archive, the social institutions of art and their mediations. Gender, Aboriginal culture, commodification, reception, technology, memory and subversive tactics are addressed. Canadian contexts are emphasized. Precludes additional credit for ARTH 5000.

ARTH 5011 [0.5 credit]

#### Graduate Practicum

Practical on-site work in the collecting institutions of the National Capital Region (as available), including a written assignment. The practicum coordinator and the on-site supervisor jointly determine the final mark. A maximum of 1.0 practicum credit may be applied towards degree requirements. Precludes additional credit for ARTH 5001.

ARTH 5012 [0.5 credit]

#### Directed Readings and Research

Students pursue topics in art and its institutions, which they select in consultation with the graduate faculty of the program. Precludes additional credit for ARTH 5002.

ARTH 5112 [0.5 credit]

#### Topics in Historiography, Methodology and Criticism

Historiographical, methodological, and critical issues in the history of art and criticism in Canadian and/or international contexts. Precludes additional credit for ARTH 5102.

ARTH 5113 [0.5 credit]

#### Perspectives on Pre-Modernity

Issues in premodern art and institutions of art production, and critical theory in light of current concerns and new research.

ARTH 5114 [0.5 credit]

#### Feminism and Gender

Art and its institutions in terms of critical issues of feminism and gender studies. Topics include the questioning of the canon, sexuality, the gaze, queer theory, the body, and the use of art as a means to communicate issues of public significance. Precludes additional credit for ARTH 5104 and ARTH 5106.

ARTH 5115 [0.5 credit]

#### Topics in Modern and Contemporary Art

The production and reception of modern and contemporary art in light of current concerns in Canadian and/or international contexts. Precludes additional credit for ARTH 5105.

ARTH 5117 [0.5 credit]

#### Community/Identity

Art and the interrelationships among the artist, architect, patron, critic and public in the context of the contribution of art and its institutions to the articulation or constitution of communal identities in Canadian and/or international contexts. Precludes additional credit for ARTH 5107.

ARTH 5210 [0.5 credit]

#### Topics in Aboriginal Art

The creative production, aesthetic culture, and reception of selected aboriginal peoples in pre-contact, historic, and/or modern time, drawing on postcolonial and critical theory. Precludes additional credit for ARTH 5200, ARTH 5204, and ARTH 5303.

ARTH 5218 [0.5 credit]

#### Museum Studies and Curatorial Practice

Aspects of museum practice, history and theoretical discourse will be examined in a classroom setting, or the preparation, realization, and/or study of an exhibition in an Ottawa-area museum. Precludes additional credit for ARTH 5207 and ARTH 5208.

ARTH 5403 [0.5 credit]

#### Architecture and Its Institutions

Specialized topics examine theory and practice of architects, architectural historians and critics from historical and contemporary perspectives in Canadian and/or international contexts.

ARTH 5500 [0.5 credit]

#### Photography and Its Institutions

Photographic practice and reception with emphasis on social, political and cultural contexts and theoretical approaches to the study of photographs in Canadian and/or international contexts.

ARTH 5908 [1.0 credit]

#### Research Essay

An examination of an approved topic that is in an area of departmental specialization.

ARTH 5909 [1.5 credits]

#### M. A. Thesis

## Biology (BIOL)

### Department of Biology

BIOL 5003 [0.5 credit] (BIO 5103)

#### Advanced Biochemistry

Advanced topics in biochemistry: the chemical structure and function of biological macromolecules, biochemical thermodynamics, metabolism, photosynthesis, lipids and membranes.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5004 [0.5 credit]

#### Advances in Applied Biochemistry

Contemporary methods of recombinant DNA technology combined with modern methods and strategies for expressing, secreting, purifying and characterizing proteins.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5105 [0.5 credit] (BIO 5302)

#### Methods in Molecular Genetics

Theory and associated applications of emerging methods in molecular genetics, including information gathered from large-scale genome-wide analysis and protein-protein interaction data, and how this information can advance understanding of cell biology.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5106 [0.5 credit] (BIO 5308)

#### Laboratory Techniques in Molecular Genetics

Laboratory course designed to give students practical experience in recent important techniques in molecular genetics.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5111 [0.5 credit]

#### Biophysical Techniques

Theory and application of current biochemical/biophysical instrumentation and techniques including X-ray crystallography, nuclear magnetic resonance spectrometry, infrared, circular dichroism and fluorescence spectroscopy, and isothermal titration and differential scanning calorimetry.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5121 [0.5 credit]

#### Advances in Protein Engineering

An advanced lecture, discussion and seminar course covering the theory, development and current techniques of protein and enzyme engineering. Topics to be discussed may also include applications in biotechnology, nanotechnology and new frontiers in basic and applied research.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5201 [0.5 credit] (BIO 8301)

#### Evolutionary Bioinformatics

Basic concepts in molecular evolution and hands-on experience with the computer analysis of DNA sequences. Topics may include molecular sequence databases, multiple alignments and phylogenetic trees.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5202 [0.5 credit] (BIO 8302)

#### Topics in Evolutionary Genetics

A lecture/seminar course on the genetic mechanisms and forces responsible for variation and evolutionary change in natural populations. Topics to include protein and genome evolution, molecular phylogenies, DNA sequences in population biology, and the evolution of multigene families.

Prerequisites: permission of the director or associate director of OCIB.

BIOL 5203 [0.5 credit] (BIO 8303)

#### Advanced Microscopy

Development of the practical skills of microscopy through original research and supporting theory lectures.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5304 [1.0 credit] (PSY 6201)

#### Fundamentals in Neuroscience

A comprehensive neuroscience course from cellular levels to neural systems and behaviour. Topics covered include aspects of neuroanatomy, neurophysiology, neuropharmacology and behavioural and cognitive neuroscience. (Also listed as NEUR 5100.)

Precludes additional credit for PSYC 5200.

BIOL 5307 [0.5 credit] (BIO 8122)

#### Advanced Insect Biology

Overview of the biological processes that allow insects to function in their environments and to overcome the constraints and limitations that the environment places on them.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5402 [0.5 credit] (BIO 8162)

#### Advanced Endocrinology

Major topics in comparative endocrinology: understanding the structure, function and evolution of vertebrate endocrine systems, including endocrine disruption.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5407 [0.5 credit] (BIO 5305)

#### Biostatistics I

Application of statistical analyses to biological data. Topics include ANOVA, regression, GLMs, and may include loglinear models, logistic regression, general additive models, mixed models, bootstrap and permutation tests.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5409 [0.5 credit] (BIO 5306)

#### Modelling for Biologists

Use and limitations of mathematical and simulation modelling approaches for the study of biological phenomena.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5501 [0.5 credit] (BIO 8900)

#### Directed Studies in Biology

One-to-one instruction in selected aspects of specialized biological subjects not covered by other graduate courses. Students may not take this course from their thesis supervisor(s), and are limited to one directed studies course per program.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5502 [0.5 credit] (BIO 8102)

**Selected Topics in Biology**

Lecture and seminar courses in selected aspects of specialized biological subjects not covered by other graduate courses.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5503 [0.5 credit] (BIO 5901)

**Biological Science in Practice**

Introduction to cross-cutting skills and issues in common to all biological disciplines. Key perspectives on philosophy of science, practical approaches to scientific publication and peer-review, data analysis and presentation, scientific inference, and technical writing will be provided through discipline-specific examples and associated practical work.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5506 [0.5 credit] (BIO 5213)

**Principles and Methods of Biological Systematics**

Biological systematics with reference to morphological and molecular character evolution and phylogeny reconstruction.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5508 [0.5 credit] (BIO 8306)

**Advanced Topics in Ecology**

Recent developments in population, community and/or ecosystem ecology.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5510 [0.5 credit]

**Advanced Evolutionary Biology**

Advances in micro- and macroevolution including the mechanisms both driving and constraining evolutionary change, phylogenetic relationships, patterns of evolutionary change at the molecular or phenotypic level, and evolutionary theory and techniques as applied to these areas.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5511 [0.5 credit]

**Advanced Evolutionary Ecology**

The ecological causes and consequences of evolutionary change, focussing on how the ecological interactions among organisms and their biotic and abiotic environments shape the evolution of phenotypic and species diversity.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5512 [0.5 credit] (BIO 8105)

**Advances in Applied Ecology**

The application of ecological and evolutionary principles in addressing resource management challenges and environmental problems.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5514 [0.5 credit]

**Advances in Aquatic Sciences**

Advanced theoretical and applied aquatic sciences including current topics in limnology and oceanography (e.g. impacts of climate change, invasive species, atmospheric pollution) with implications for lake, river, coastal and wetland management.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5515 [0.5 credit] (BNF 5106)

**Bioinformatics**

Major concepts and methods of bioinformatics. Topics may include genetics, statistics and probability theory, alignments, phylogenetics, genomics, data mining, protein structure, cell simulation and computing.

BIOL 5516 [0.5 credit]

**Applied Bioinformatics**

Computational knowledge discovery in and the dynamic nature of cellular networks. Includes, but is not limited to, knowledge representation, large scale data integration, data mining and computational systems biology.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5517 [0.5 credit] (BNF 6100)

**Bioinformatics Seminar**

Current topics in bioinformatics. Students must successfully complete a presentation and written report.

BIOL 5518 [0.5 credit]

**Biostatistics II**

Application of multivariate methods to biological data, including methods such as discriminant functions analysis, cluster analysis, MANOVA, principle components analysis.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5520 [0.5 credit]

**Advances in Conservation Biology**

Interdisciplinary exploration of the science of scarcity and diversity in a human dominated world.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5521 [0.5 credit]

**Evolutionary Genetics**

Genetic mechanisms and processes responsible for variation and evolutionary change in natural populations. Topics may include population and quantitative genetics as applied to protein and genome evolution, molecular phylogenies, DNA sequences in population biology, and the evolution of multigene families.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5605 [0.5 credit] (BIO 5102)

**Advanced Field Ecology**

Field experience in a new environment (e.g., local, national, international) to learn about ecological processes (note - extra fees associated with course).

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5709 [0.5 credit] (BIO 8113)

**Chemical Toxicology**

An introduction to modeling chemical hazards and exposures at the cellular level. The properties of toxic substances are compared to the responses of enzymatic systems. These interactions are defined as Quantitative Structure-Activity Relationships and used to interpret hazardous materials under regulations such as WHMIS. (Also listed as CHEM 5709/CHM 8157)

Prerequisite: BIOL 6402/CHEM 5708 (BIO 9101/CHM 8156), and permission of the director or associate director of OCIB.

BIOL 5801 [0.5 credit] (BIO 5105)

**Advanced Neuroethology**

A comparative and evolutionary approach to studying neural mechanisms underlying animal behaviour, including genetic, neural and hormonal influences on behaviour.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5802 [0.5 credit] (BIO 8365)

**Advanced Behavioural Ecology**

Recent advances in behavioural ecology including topics such as the evolution of tactics and strategies of group living, foraging, anti-predation, resource use and defence, cooperation, reproduction, and parental care.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 5909

**M.Sc. Thesis**

BIOL 6001 [0.5 credit] (BIO 8109)

**Advanced Molecular Biology**

In-depth coverage of the structure, function, and synthesis of DNA, RNA, and proteins.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6002 [0.5 credit] (BIO 8116)

**Advances in Plant Molecular Biology**

Use of molecular genetics in general plant biology and the contribution of plant genomics to our understanding of plant metabolism, plant development, and plant interactions with the environment at the molecular, genome, and cellular levels.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6201 [0.5 credit] (BIO 8117)

**Advanced Cell Biology**

Recent advances in cell biology, including such topics as membranes, signalling, the cytoskeleton and control of the cell cycle.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6202 [0.5 credit] (BIO 8118)

**Advanced Cell Biology II**

Topics for discussion may include: the structure, composition and three-dimensional organization of the nucleus, mechanisms and regulation of genome replication, structure organization of transcription. Nuclear reorganization during gamete development, fertilization, viral infection and the mitotic cell cycle. Normally offered in alternate years.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6203 [0.5 credit]

**Special Topics in Neuroscience**

In-depth study of current topics in neuroscience. Course content varies yearly and has recently included cognitive neuroscience, neuropharmacology, neurodegeneration, and behavioural medicine. (Also listed as NEUR 5800.)

BIOL 6204 [0.5 credit]

**Techniques in Neuroscience**

Completion of a research project carried out under the supervision of a neuroscience faculty member, normally not the current supervisor. The student will learn a new neuroscience technique and apply it to a research objective. Students must obtain prior approval from the graduate committee. (Also listed as NEUR 6301 and NEUR 6302.)

Precludes additional credit for PSYC 6204.

BIOL 6300 [0.5 credit] (BIO 8320)

**Advanced Plant Biology**

Recent developments in plant biology. Topics may include plant anatomy, systematics, evolution, genetics, ecology, ethnobotany, cell biology, and/or biotechnology.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6304 [0.5 credit] (BIO 8361)

**Advanced Animal Physiology**

Recent advances in animal physiology, emphasizing comparative, evolutionary and environmental approaches.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6305 [0.5 credit]

**Advanced Seminar in Neuroscience**

A comprehensive pro-seminar series, covering issues ranging from cellular and molecular processes through to neural systems and behaviours as well as psychopathology. Students will also be required to attend the neuroscience colloquia series as part of this course. (Also listed as NEUR 6100.)

Precludes additional credit for PSYC 6200, PSYC 6202, PSYC 6203, BIOL 6303.

Prerequisite: BIOL 5304 or equivalent.

BIOL 6402 [0.5 credit] (BIO 9101)

**Principles of Toxicology**

The basic theorems of toxicology with examples of current research problems. The concepts of exposure, hazard and risk assessment will be defined and illustrated with experimental material from some of the more dynamic areas of modern research. (Also listed as CHEM 5708/CHM 8156/TOX8156.)

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6403 [0.5 credit] (BIO 9104)

**Ecotoxicology**

Advances in ecotoxicology with emphasis on the biological effects of contaminants. The potential for biotic perturbation resulting from chronic and acute exposure of ecosystems to selected toxicants will be covered along with the methods pesticide, herbicide and pollutant residue analysis and the concept of bound residues. (Also listed as CHEM 5705/CHM 9109/TOX9104.)

Prerequisite: BIOL 6402/CHEM 5708 (BIO 9101/CHM 8156), permission of the director or associate director of OCIB.

BIOL 6404 [0.5 credit] (BIO 8938)

**Plant: Animal Interactions**

The biology of co-evolutionary relationships between plants and phytophagous animals.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6405 [0.5 credit] (BIO 9105)

**Seminar in Toxicology**

A seminar course highlighting current topics in toxicology. The student will present a seminar and submit a report on the seminar topic. Student, faculty and invited seminar speakers. (Also listed as CHEM 5805/CHM 8167/TOX9105.)

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6406 [0.5 credit] (BIO 9106/TOX 9106)



**Genetic Toxicology**

Topics in mutagenesis and DNA repair, including spontaneous and induced mutagenesis, genetic toxicology testing, the genetics and biochemistry of replication, DNA repair and recombination, and the role of mutagens in the development of genetic disease and cancer.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6505 [0.5 credit] (BIO 8108)

**Advanced Topics in Development**

Recent advances in developmental biology. Topics may include embryonic induction, regulation of morphogenesis and differentiation, mechanisms of regional specification and pattern formation, and developmental genetics. Offered in alternate years.

Prerequisite: permission of the director or associate director of OCIB.

BIOL 6909

**Ph.D. Thesis**

## Biomedical Engineering (BIOM) Systems and Computer Engineering

BIOM 5010 [0.5 credit]

### Introduction to Biomedical Engineering

Research ethics and methods. Engineering systems approach to analysis and modelling of human anatomy and physiology. Introduction to topics including biomechanics, electrophysiology, and computational biology. Biomedical technologies. Impact of technology on society.

BIOM 5100 [0.5 credit] (BMG 5103)

### Biomedical Instrumentation

Instrumentation designed to measure physiological variables related to the function of the heart, lungs, kidney, nervous and musculo-skeletal system; emergency, critical care, surgery and anaesthesia equipment.

Precludes additional credit for SYSC 5302 (ELG 6320).

Prerequisite: permission of the instructor.

BIOM 5101 [0.5 credit] (BMG 5104)

### Biological Signals

Modeling of neuromuscular biological signals, including subthreshold phenomena, active behaviour of cell membranes, and innervation processes. Measurement of biological signals, including electrode effects. Time domain, frequency domain, and adaptive filtering techniques for noise reduction. (Also offered as SYSC 5307 (ELG 6307)).

BIOM 5106 [0.5 credit] (BMG 5109)

### Advanced Topics in Medical Instrumentation

Recent and advanced topics in the field of medical instrumentation and its related areas.

BIOM 5200 [0.5 credit] (BMG 5105)

### Biomedical Image Processing

Mathematical models of image formation based on the image modality and tissue properties. Linear models of image degradation and reconstruction. Inverse problems and regularization for image reconstruction. Image formation in radiology, computed tomography, magnetic resonance imaging, nuclear medicine, ultrasound, positron emission tomography, electrical impedance tomography.

Prerequisite: permission of the instructor.

BIOM 5201 [0.5 credit] (BMG 5106)

### Introduction to Medical Imaging Principles and Technology

Basic principles and technological implementation of x-ray, nuclear medicine, magnetic resonance imaging (MRI), and other imaging modalities used in medicine. Contrast, resolution, storage requirements for digital images. Applications outside medicine, future trends.

Precludes additional credit for PHYS 5201.

Prerequisite: permission of the Physics department.

BIOM 5202 [0.5 credit] (BMG 5107)

### Wavelet Applications in Biomedical Image Processing

Introduction to wavelet analysis and processing techniques for the quantification of biomedical images and signals. Topics include: multiresolution algorithms for denoising and image restoration, multiscale segmentation and classification for computer aided diagnosis and compression.

Prerequisite: SYSC 5602/ELG 5376 and BIOM 5200/ BMG 5105, or permission of the instructor.

BIOM 5203 [0.5 credit] (BMG 5108)

### Advanced Topics in Biomedical Image Processing

Recent and advanced topics in the field of biomedical image processing and its related areas.

Prerequisite: permission of the instructor.

BIOM 5300 [0.5 credit] (BMG 5300)

### Biological and Engineering Materials

Properties of structural biological materials (bone, tendon, ligament, skin, cartilage, muscle, and blood vessels) from an engineering materials viewpoint. Selection of engineering materials as biomaterials. Introduction to biocompatibility. Histology of soft tissues. Viscoelasticity, mechanical properties and models of muscles, ligaments and tendons.

Co-requisite: BIOM 5100 (BMG 5100).

Prerequisite: permission of the instructor.

BIOM 5301 [0.5 credit] (BMG 5301)

### Biomechanics of Skeletal System, Motion and Tissue

Analysis of human motion. Kinematics and kinetics of various activities. Engineering analysis and modeling techniques applied to human motion. Injury mechanics, treatment, prosthetic replacements.

Fracture behaviour and healing processes.

Prerequisite: permission of the instructor.

BIOM 5302 [0.5 credit] (BMG 5302)

### Biofluid Mechanics

Properties of blood. Blood flow models for vessels, circulation systems and the heart. Artificial blood vessels. Kidney flow and exchange. Modeling of perfused tissues and cells. Transport phenomena across membranes. Molecular and ionic transport. Other body fluids.

Prerequisite: permission of the instructor.

BIOM 5303 [0.5 credit] (BMG 5303)

### Ergonomics and Design

Review of ergonomic issues encountered in engineering design, including biomechanical, physical and physiological issues. Strategies for human interaction with complex systems, such as aircraft cockpits, equipment control consoles, human-robotic interactions, and tele-operated equipment.

Prerequisite: permission of the instructor.

BIOM 5304 [0.5 credit] (BMG 5110)

### Advanced Topics in Biomechanics and Biomaterials

Recent and advanced topics in the field of biomechanics and biomaterials and its related areas.

BIOM 5306 [0.5 credit] (BMG 5306)

### Special Topics in Mechanical and Aerospace Engineering: Biomechanics

Overview of human anatomy and physiology with emphasis on artificial organ and prosthetic device design requirement. Application of engineering principles to cells and tissues, biofluid mechanics, human body energetics, measurement techniques, mechanics of human body systems, with emphasis on the artificial heart. Offered at the undergraduate level, with different requirements, as MAAE 4906, for which additional credit is precluded.

Precludes additional credit for MCG 5489/MECH 5801.

BIOM 5311 [0.5 credit] (BMG 5311)

### Design of Medical Devices and Implants

Solutions to clinical problems through the use of implants and medical devices. Pathology of organ failure and bioengineering and clinical aspects of artificial organs. Examples: blood substitutes, oxygenators, cardiac support, vascular substitutes, pacemakers, ventricular assist devices, artificial hearts and heart valves.

Prerequisite: permission of the instructor.

BIOM 5312 [0.5 credit] (BMG 5312)

**Design of Orthopaedic Implants and Prostheses**

Anatomy of the musculo-skeletal system.

Electromyography. Static and dynamic analysis of the human skeleton. Materials and manufacturing considerations for orthopaedic devices. Strength and failure theories. Implant fatigue, fracture and corrosion.

Prerequisite: permission of the instructor.

BIOM 5314 [0.5 credit] (BMG 5314)

**Biocontrols**

Application of traditional control system principles to the human body. Functionality of sample actuators and sensors. Characterization of human body control loops with emphasis on system stability, robustness, and effect of adverse external disturbance.

Prerequisite: permission of the instructor.

BIOM 5315 [0.5 credit] (BMG 5315)

**Biorobotics**

Interpretation of physical laws as applied to human motion, kinematics and dynamics of humanoid robots, modeling of biological sensors and actuators, artificial muscles, tele-manipulation, robot assisted surgery, and multi-fingered end-effectors. Design of mechatronic devices including rehabilitators, extenders, haptic devices, and minimally invasive surgery systems.

Prerequisite: permission of the instructor.

BIOM 5316 [0.5 credit] (BMG 5316)

**Biotransport Processes**

Application of chemical engineering principles to medicine and biology. Principles of mass transfer and fluid dynamics in topics such as hemodialysis, artificial kidney, diffusion in blood, mass transfer in the eye, drug distribution in the body, and advanced life support systems.

Prerequisite: permission of the instructor.

BIOM 5323 [0.5 credit] (BMG 5323)

**Rehabilitation Engineering**

Multidisciplinary approach to assistive-device design. Biomechanics applied to rehabilitation. Gait, neurological disorders, pathological gait, prosthetics, orthotics, seating, and mobility. Transducers, bio-instrumentation, EMG, FES. Augmentive communication and sensory aids. Human-assistive device interfaces, human-robot interfaces, computer-vision-guided rehabilitation aids, telerehabilitation.

Prerequisite: permission of the instructor.

BIOM 5330 [0.5 credit] (BMG 5330)

**Electromagnetic Fields and Biological Systems**

Review of electromagnetic waves at radio and microwave frequencies. Electrical and magnetic properties of tissue. Impact of electromagnetic waves on tissue. Cellular effects.

Prerequisite: permission of the instructor.

BIOM 5400 [0.5 credit] (BMG 5317)

**Medical Computing**

Introduction to information technology research used in the medically related fields such as biotechnology, cancer treatment, and biometric. Topics may include: medical imaging, telemedicine, telesurgery, DNA analysis, and medical information systems.

Prerequisite: permission of the instructor.

BIOM 5401 [0.5 credit] (BMG 5318)

**Advanced Health Care Engineering**

Healthcare and technology; overview of medical devices and sensors; safe and effective use and management of technology; telemedicine; medical databases, data collection, storage, retrieval and computers in medicine; electronic patient records, PACS; clinical decision-support systems.

Precludes additional credit for SYSC 5300 (ELG 6130) or EACJ 5303 (ELG 5123).

Prerequisite: permission of the instructor.

BIOM 5402 [0.5 credit] (BMG 5402)

**Interactive Networked Systems and Telemedicine**

Telemanipulator; human motoring and sensory capabilities; typical interface devices; mathematical model of haptic interfaces; haptic rendering; stability and transparency; remote control schemes; time delay compensation; networking and real-time protocols, history and challenges of telemedicine; telemedicine applications: telesurgery, tele-monitoring, tele-diagnosis and tele-homecare.

Prerequisite: permission of the instructor.

BIOM 5403 [0.5 credit] (BMG 5111)

**Advanced Topics in Medical Informatics and Telemedicine**

Recent and advanced topics in the field of medical informatics and telemedicine and its related areas.

BIOM 5405 [0.5 credit]

**Pattern Classification and Experiment Design**

Introduction to a variety of supervised and unsupervised pattern classification techniques with emphasis on correct application. Statistically rigorous experimental design and reporting of performance results. Case studies will be drawn from various fields including biomedical informatics. (Also listed as SYSC 5405 (ELG6102).)

Prerequisite: undergraduate introductory probability and statistics.

BIOM 5800 [0.0 credit] (BMG 5800)

**Biomedical Engineering Seminar**

This course is in the form of seminars presented by graduate students and other researchers in the area of Biomedical Engineering. To complete this course, a student must attend at least ten seminars and make one presentation in the context of this seminar series.

BIOM 5906 [0.5 credit] (BMG 7199)

**Directed Studies in Biomedical Engineering**

Various possibilities exist for pursuing directed studies on topics approved by a course supervisor, including the above-listed course topics where they are not offered on a formal basis.

BIOM 5909 [2.5 credits] (BMG 5909)

**M.A.Sc. Thesis**

**Business (BUSI)****Sprott School of Business**

BUSI 5801 [0.25 credit]

**Statistics for Managers**

Techniques for using data to make an informed use of statistics. Applications, interpretation and limitations of results. Sampling, descriptive statistics, probability concepts, estimation and testing of hypotheses and regression, using practical business situations. Precludes additional credit for BUSI 5904.

BUSI 5802 [0.25 credit]

**Business Ethics**

Impact of corporate decisions on society. Models and standards of business ethics and corporate social responsibility (CSR). Methods of measuring and reporting. The rise of corporate power, stakeholder analysis, corporate governance, sustainability, national and international pressures on CSR.

BUSI 5803 [0.25 credit]

**Managerial Economics**

The application of economic principles and methodologies to business decision problems. The logic and consequences of consumer and producer decision-making and the resultant market outcomes. Precludes additional credit for BUSI 5604.

BUSI 5900 [0.5 credit]

**Tutorials/Directed Studies in Business**

Tutorials or directed readings in selected areas of business, involving presentation of papers as the basis for discussion with the tutor.

Prerequisite: admission to the program prior to the fall term of 2008 and permission of the M.B.A. Program Director. Completion of an undergraduate business course may be required.

BUSI 5907 [0.5 credit]

**M.B.A. Thesis Tutorial**

A seminar designed to help the student formulate and evaluate specific research topics. The successful submission of a thesis proposal is necessary for the completion of the course.

Prerequisite: admission to the program prior to the fall term of 2008 and permission of the M.B.A. Program Director.

BUSI 5908 [1.0 credit]

**M.B.A. Research Project**

Prerequisite: admission to the program prior to the fall term of 2008 and permission of the M.B.A. Program Director.

BUSI 5909

**M.B.A. Thesis Research**

Prerequisite: BUSI 5907 and admission to the program prior to the fall term of 2008 and permission of the M.B.A. Program Director.

BUSI 5999 [1.0 credit]

**Practicum**

As a condition for graduation, all students in the daytime stream with less than 2 years of management or professional employment experience are required to have a minimum of four months practical management experience. The practicum will be selected and assigned by the Director of the M.B.A. program. Details are available from the School.

BUSI 6100 [0.5 credit]

**Seminar in Modern Organization Theory**

The development of post-structuralist organization theory is examined. Theories of organizational culture and symbolism, political theories of organization, ethnomethodological, decision-based and population ecology approaches are investigated. The social, economic, and intellectual forces shaping organization theory provides a major focus.

BUSI 6101 [0.5 credit]

**Current Topics in Organizational Behaviour**

Current topics and debates in the research on organizational behaviour. Potential topics include motivation, learning, communication, decision-making, small group behaviour, leadership, careers, power and conflict.

BUSI 6200 [0.5 credit]

**Seminar in Marketing I**

Marketing theory, history, and developments through the analysis, synthesis, and extension of theoretical and empirical papers on: the marketing concept, the role of marketing in various types of organizations, defining and segmenting markets; managing new product introductions, established products and marketing planning.

BUSI 6201 [0.5 credit]

**Seminar in Marketing II**

Marketing decision-making practice and theory in business and not-for-profit organizations in such areas as consumer decision-making, organizational decision-making, analytical methods, and research methods to aid in marketing decision-making.

BUSI 6300 [0.5 credit]

**Seminar in Management of Production/Operations I: Strategic Management of Production Systems**

Developing the firm's strategies with respect to facilities, locations, production technologies, and sourcing arrangements. Recent developments in management policies and practices that enable production systems to operate at full potential in the wake of time- and quality-based competition.

BUSI 6301 [0.5 credit]

**Seminar in Management of Production/Operations II: Production/Technology/Strategy Interface**

The evolution and management of process innovation; management of productivity using production technologies; integration of production strategy and technology; and interactions with research and development. Topics include quality function deployment and the deployment of process innovations.

BUSI 6400 [0.5 credit]

**Seminar in Information Systems I: Information and Computing Technologies in Management**

The role of computing and communications technologies and information systems in the functioning of organizations and managers. Current developments in the information systems field.

BUSI 6401 [0.5 credit]

**Seminar in Information Systems II: Analysis and Design of Information Systems**

Theory and practice concerning factors determining the effective use of computing technologies, particularly on the match between the information systems and its users.



BUSI 6500 [0.5 credit]

**Seminar in Finance I**

Selected topics in financial theory. Topics are chosen according to new developments in theory and with the interests of the students in mind. These may include theory of derivatives, pricing theory, information asymmetries, agency theory, economic efficiency, and empirical methods.

BUSI 6501 [0.5 credit]

**Seminar in Finance II**

Emerging areas in finance such as total quality management, left-hand financing, activity-based costing, multi-criteria decision-making, neural networks, etc. Integrative problems spanning two or more functional disciplines in management, such as taxation.

BUSI 6701 [0.5 credit]

**Choice Behaviour**

Examines choice behaviour from a variety of disciplines. Topics covered may include individual choice models in economics, Von-Neumann-Morgenstern utility, Luce Choice Axiom and its extensions, multi-criteria individual choice behaviour, and multi-criteria group choice behaviour.

BUSI 6702 [0.5 credit]

**Analysis and Representation of Complex Problems**

This course uses qualitative and quantitative techniques and theoretical frameworks to represent organizational systems, problems and decisions that executives and managers face. The qualitative models are viewed as primary, providing the setting for the quantitative models, selection of choice mechanism, and interpretation of solutions.

BUSI 6703 [0.5 credit]

**Systems Concepts in Management**

A unified outlook toward management theory is developed through specifying system variables, components, boundaries and limitations. The importance of computer-based systems for analyzing and managing integrated systems in the context of control, decision-making and model-building.

BUSI 6704 [0.5 credit]

**Managing the Change Process**

The process of organizational change and the external forces which drive such changes. Topics include both micro and macro theories of change and issues around change management such as leadership and resistance to change.

BUSI 6801 [0.5 credit]

**Management of Technology**

Introduction to issues in the management of technology. Topics include: technology strategy and policy, technology forecasting and planning, the process of technology innovation from concept to market, research and development management, technology adoption, diffusion and implementation, technology transfer, and technology and social issues.

BUSI 6802 [0.5 credit]

**Women in Management**

An exploration of the research and organizational challenges arising from changing gender roles. Topics include: the sex segregation of work, gender differences in management styles, work-family conflict, women's careers, managing sexual harassment, employment equity and pay equity.

BUSI 6803 [0.5 credit]

**Corporate Strategy and Policy**

Theories of the firm, origins of the modern corporation, analysis of the external environment, industry analysis, value chain analysis, resource-based theory, distinctions between corporate and business strategy, economies of scope, diversification and sustainable competitive advantage.

BUSI 6804 [0.5 credit]

**International Business Strategy**

An advanced examination of contemporary theory on international business expansion. Topics include trade and investment flow interactions; expansion modes, location theory, and sequential expansion; globalization, consumer behaviour, and culture; trans-border information flows; internationalization by firm size; strategic alliances; and free trade blocs.

BUSI 6805 [0.5 credit]

**Canadian Business Competitiveness**

Competitiveness at the country, industry, and firm levels, examined in the context of Canada's unique characteristics from various domestic and international perspectives including industrial organization theory, comparative perspectives on industrial concentration, internalization theory, Porter's competitiveness diamond, business-government interactions, and government support programs for business.

BUSI 6806 [0.5 credit]

**Entrepreneurship**

An examination of research in entrepreneurship focusing on theory building and empirical testing of factors that shapes the identification, evaluation and exploitation of opportunities and the creation of new organizations. Topics include: environmental influences on formation and growth, theories of growth and entrepreneurial clustering.

BUSI 6900 [0.5 credit]

**Directed Readings**

Directed readings in selected areas of business, involving presentation of papers as the basis for discussion. A part of the requirement for the course may be participation in an advanced course at the undergraduate/graduate level.

Prerequisite: permission of the School.

BUSI 6901 [0.5 credit]

**Special Topics**

Designed to expose students to new and emerging issues in selected areas of business research.

Integrative problems involving two or more areas of business research are also explored. The topics covered may vary from year to year.

Prerequisite: permission of the School.

BUSI 6902 [0.5 credit]

**Research Methodology in Business**

The study of research techniques commonly used in research on business and management issues. The development of knowledge of these methodologies and their application, and their possible use in the thesis research of the student are the two main goals of this course.

BUSI 6905 [0.5 credit]

**Advanced Statistical Methods for Business Research**

A practical introduction to advanced statistical methods used in business research, with particular focus on discrete categorical data. Topics include the analysis of two-way and three-way tables; loglinear modeling; logistic regression; generalized linear models. Students will analyze real data using appropriate software packages.

Graduate Courses - Business (BUSI)

BUSI 6906 [0.5 credit]

**Advanced Methods and Models of Management Science**

Advanced study of decision-making under certainty and uncertainty. Topics include: constrained and unconstrained optimization; project management; scheduling and facilities location; multi-objective dynamic programming; multi-attribute utility theory; discrete choice. Links between theory and application will be illustrated through case studies and applied modeling.

BUSI 6907 [0.5 credit]

**Ph.D. Thesis Tutorial**

An intensive preparation for Ph.D. thesis research, under the direction of one or more members of the School. The successful submission of a thesis proposal is necessary for the completion of the course.

BUSI 6908

**Ph.D. Comprehensives**

Preparation for comprehensive examinations.

BUSI 6909

**Ph.D. Thesis**

## Canadian Studies (CDNS)

### School of Canadian Studies

CDNS 5001 [0.5 credit]

#### **M.A. Core Seminar: Conceptualizing Canada**

Interdisciplinary perspectives on theoretical and methodological approaches to Canadian Studies.  
Prerequisite: Graduate standing in the School.

CDNS 5002 [0.5 credit]

#### **Interdisciplinary Methods**

A survey of the issues raised by problem-directed methodologies; critiques of existing methodology including from the standpoints of feminist and Aboriginal scholarship.

CDNS 5003 [0.5 credit]

#### **Selected Topics in Canadian Studies**

Topic varies from year to year.

CDNS 5101 [0.5 credit]

#### **Indigenous Peoples, Canada and the North**

Interdisciplinary seminar exploring selected Indigenous issues as they relate to historical and ongoing changes in material, social, and cultural phenomena and relationships.  
Precludes additional credit for CDNS 5100.

CDNS 5102 [0.5 credit]

#### **Indigenous Politics and Resurgence in Canada**

Interdisciplinary seminar exploring selected themes in Indigenous politics, experience, and philosophy since the 1960s. Builds on CDNS 5101.  
Precludes additional credit for CDNS 5100.  
Prerequisite: CDNS 5101 or permission of the School of Canadian Studies.

CDNS 5201 [0.5 credit]

#### **Critical Perspectives on Canadian Feminism**

Interdisciplinary seminar examining Canadian contributions to feminist and gender theory as well as developments in women's movements in a Canadian context.  
Precludes additional credit for CDNS 5200.

CDNS 5202 [0.5 credit]

#### **Gendering Canada: Selected Contemporary Debates**

Interdisciplinary seminar focusing on specific themes that define Canadian women's and gender studies. Themes change yearly but past topics have included sexuality and sexual practices, health and reproductive rights, the body, motherhood and work.  
Precludes additional credit for CDNS 5200.

CDNS 5301 [0.5 credit]

#### **Canadian Cultural Studies**

The arts, belief systems, institutions and communicative practices in Canada in relation to other social and historical structures.  
Precludes additional credit for CDNS 5300.

CDNS 5302 [0.5 credit]

#### **Canadian Cultural Policy**

Evolution of Canadian cultural policy from its origins through to the contemporary search for cultural cohesion within a global context, emphasizing developments since the Massey Commission.  
Precludes additional credit for CDNS 5300.

CDNS 5401 [0.5 credit]

#### **Heritage Conservation I: History, Principles, and Concepts**

History of heritage conservation theory in Canada and abroad, as it affects both tangible and intangible heritage; development of the field's conceptual frameworks and operational principles for understanding, evaluating, conserving and managing significant Canadian places of heritage value. Note: students registering in this course are strongly encouraged to register in CDNS 5402.  
Precludes additional credit for CDNS 5400.

CDNS 5402 [0.5 credit]

#### **Heritage Conservation II: Theory in Practice**

Application of heritage conservation theory to practice. Models for conservation and management of heritage resources in Canada. Research, planning, development, interpretation and the interplay of disciplines within these conservation domains. Frameworks for evaluating programs and policies. Field exercises and visits.  
Precludes additional credit for CDNS 5400.  
Prerequisite: CDNS 5401 or permission of the School of Canadian Studies.

CDNS 5501 [0.5 credit]

#### **Decolonizing Canada: Cultural Politics and Collective Identities**

Interdisciplinary examination of the politics of race, gender, class and cultural pluralism in Canada. Critical theoretical exploration of nationalism, regionalism, multiculturalism, neoliberalism, Aboriginal politics, diaspora and global human rights regimes and claims.

CDNS 5601 [0.5 credit]

#### **Constructing Canada: The Politics of National Identity**

Interdisciplinary examination of national identity, public opinion, and public policy; the intersection of national visions of Canada and public policy; and the articulation of Canadian distinctiveness and sovereignty on the world stage. Topics include nationalism and national identity, branding Canada, and selected policy fields.

CDNS 5700 [0.5 credit]

#### **Arctic Passages: The Changing Dynamics of Canada's North**

Interdisciplinary exploration of changing political, economic, and cultural relationships between Inuit and non-Inuit interests in the Canadian Arctic. Emphasis on the role of global processes, such as the rise of the circumpolar movement and environmental change, in mediating these relationships.

CDNS 5800 [1.0 credit]

#### **Internship/Practicum**

Internships or practicum placements are set in an institutional setting outside of the University. Students in the research essay option are restricted to a maximum of 0.5 credits in an Internship/Practicum. Students must complete a formal written paper in addition to their internship/practicum activities.  
Prerequisite: completion of one full credit of coursework in Canadian Studies and prior approval of the School of Canadian Studies. For students in the coursework option only.

CDNS 5801 [0.5 credit]

**Internship/Practicum**

Internships or practicum placements are set in an institutional setting outside of the University. Students in the research essay option are restricted to a maximum of 0.5 credits in an Internship/Practicum. Students must complete a formal written paper in addition to their internship/practicum activities. Prerequisite: completion of one full credit of coursework in Canadian Studies and prior approval of the School of Canadian Studies. For students in the coursework or research essay option only.

CDNS 5900 [1.0 credit]

**Directed Studies**

Reading and research tutorials supervised by a qualified adviser, in an area not covered by an existing seminar. Directed Studies are organized by individual students with a faculty member. Students in the thesis or research essay option are restricted to a maximum of 0.5 credits in a Directed Studies course. Prerequisite: prior approval of the School of Canadian Studies.

CDNS 5901 [0.5 credit]

**Directed Studies**

Reading and research tutorials supervised by a qualified adviser, in an area not covered by an existing seminar. Directed Studies are organized by individual students with a faculty member. Students in the thesis or research essay option are restricted to a maximum of 0.5 credit in a Directed Studies course. Prerequisite: prior approval of the School of Canadian Studies.

CDNS 5908 [1.0 credit]

**Research Essay**

Approval of the Research Essay Proposal is required prior to registration in this course.

CDNS 5909 [2.0 credits]

**M.A. Thesis**

Approval of the Thesis Proposal is required prior to registration in this course.

CDNS 6900 [1.0 credit]

**Ph.D. Core Seminar: Interdisciplinarity in Canadian Studies: Concepts, Theories & Methods**

Available only to Ph.D. students in Canadian Studies. An examination of the complex theoretical and methodological issues associated with the discourse on an interdisciplinary study of Canada. Offered at Carleton and Trent through a combination of joint sessions at both universities and regular electronic communication. Prerequisite: enrolment in the Canadian Studies Ph.D. program.

CDNS 6901 [0.5 credit]

**Ph.D. Tutorial**

Available only to Ph.D. students in Canadian Studies. Reading and research tutorials. A program of research and written work in an area not covered by an existing graduate seminar. Prerequisite: permission of the School of Canadian Studies.

CDNS 6902 [0.5 credit]

**Ph.D. Tutorial**

Available only to Ph.D. students in Canadian Studies. Reading and research tutorials. A program of research and written work in an area not covered by an existing graduate seminar. Prerequisite: permission of the School of Canadian Studies.

CDNS 6905 [0.5 credit]

**Ph.D. Comprehensive Examination**

Available only to Ph.D. students in Canadian Studies. Students will receive a grade of Satisfactory, Unsatisfactory or Pass with Distinction. Prerequisite: permission of the School of Canadian Studies.

CDNS 6907 [0.5 credit]

**Ph.D. Comprehensive Examination**

Available only to Ph.D. students in Canadian Studies. Students will receive a grade of Satisfactory, Unsatisfactory or Pass with Distinction. Prerequisite: permission of the School of Canadian Studies.

CDNS 6909

**Ph.D. Thesis**

Prerequisite: permission of the School of Canadian Studies.



## Chemistry (CHEM)

### Department of Chemistry

CHEM 5002 [0.25 credit] (CHM 8301)

**Multinuclear Magnetic Resonance Spectroscopy**  
Principles of Nuclear Magnetic Resonance (NMR). NMR parameters to be studied are: chemical shift, spin-spin coupling, electric quadrupole coupling, spin-spin and spin-lattice relaxation rates. NMR and the periodic table. Dynamic NMR. Applications in chemistry and biochemistry. The Fourier Transform technique. Pulse sequences. Basic principles and applications of two-dimensional NMR.

CHEM 5003 [0.25 credit] (CHM 8325)

**Solid State NMR Spectroscopy**  
Brief introduction to solid state NMR spectroscopy. Topics include dipolar coupling interactions, chemical shielding anisotropy, the quadrupolar interaction and averaging techniques such as magic angle spinning.

CHEM 5102 [0.25 credit] (CHM 8346)

**Supercritical Fluids**  
Fundamental and practical aspects of the uses of supercritical fluids in the chemistry laboratory. Thermodynamic treatment of high pressure multicomponent phase equilibria, transport properties, solubilities, supercritical fluid extraction and chromatography for analytical purposes, reactions in supercritical fluids, equipment considerations, new developments.

CHEM 5108 [0.5 credit] (CHM 8302)

**Surface Chemistry and Nanostructures**  
Surface structure, thermodynamics and kinetics, specifically regarding adsorption/desorption and high vacuum models. Nanoscale structures and their formation, reactivity and characterization. Thin films, carbon nanotubes, self-assembled monolayers and supramolecular aggregates. Also offered at the undergraduate level, with different requirements, as CHEM 4103, for which additional credit is precluded.

CHEM 5109 [0.5 credit]

**Advanced Applications in Mass Spectrometry**  
Detailed breakdown of the physical, electrical and chemical operation of mass spectrometers. Applications in MS ranging from the analysis of small molecules to large biological macromolecules. Descriptions of the use of mass spectrometry in industry as well as commercial opportunities in the field. Also listed at the undergraduate level, with different requirements, as CHEM 4302, for which additional credit is precluded. Lectures and seminars three hours a week.

CHEM 5206 [0.5 credit]

**Physical Methods of Nanotechnology**  
An overview of methods used in nanotechnology. Principles of scanning probe techniques ranging from surface physics to biology. State of the art methods to create nanostructures for future applications in areas such as nanolithography, nanoelectronics, nano-optics, data storage and bio-analytical nanosystems.

CHEM 5207 [0.25 credit]

**Macromolecular nanotechnology**  
Fundamentals of synthetic macromolecules related to nanoscale phenomena. Challenges and opportunities associated with polymers on the nanoscale. Topics include molecular recognition, self-assembled nanostructures, functional nanomaterials, amphiphilic architectures, nanocomposites, and nanomachines. Applications to sensing, drug delivery, and polymer based devices. Also offered at the undergraduate level, with different requirements, as CHEM 4203, for which additional credit is precluded. Lectures three hours a week.

CHEM 5208 [0.25 credit]

**Bio Macromolecular nanotechnology**  
Fundamentals of biological macromolecules related to nanoscale phenomena. Challenges and opportunities associated with natural polymers on the nanoscale. Topics include molecular recognition, self-assembled nanostructures, scaffolds and templates, functional nanomaterials, amphiphilic architectures, nanocomposites, and nanomachines. Applications to sensing, biomaterials, drug delivery, and devices. Also offered at the undergraduate level, with different requirements, as CHEM 4203, for which additional credit is precluded. Lectures three hours a week.

CHEM 5304 [0.25 credit] (CHM 8349)

**Free Radicals in Chemistry and Biology**  
Oxidative stress induced by free radicals plays a significant role in fatal and chronic diseases. The chemistry of bio-radicals will be described and related to pathobiological processes such as lipid peroxidation and atherosclerosis, protein nitration and cross linking, and DNA scission.

CHEM 5305 [0.25 credit] (CHM 8356)

**Physical Methods in Inorganic Chemistry**  
Characterization of inorganic materials and coordination complexes by electronic absorption and electron paramagnetic spectroscopies, temperature and field dependent magnetic susceptibilities, and crystallography.

CHEM 5309 [0.25 credit] (CHM 8347)

**Electron Transfer: Theory and Experiment**  
The development of classical, semi-classical and quantum mechanical electron transfer models is described. In addition, the course will examine recent experimental results and the application of electron transfer theory to biological systems.

CHEM 5406 [0.5 credit] (CHM 8164)

**Organic Polymer Chemistry**  
Basic principles of industrial and synthetic polymers. Polymerization and polymer characterization. Topics to cover some important polymers with emphasis on synthesis, commodity plastics, engineering thermoplastics and specialty polymers. Also offered at the undergraduate level, as CHEM 4204, for which additional credit is precluded. Prerequisites: CHEM 3201 and CHEM 3202 and/or CHEM 4203 or the equivalent. Students should have a basic knowledge of organic reaction mechanisms and stereochemistry.

CHEM 5407 [0.5 credit] (CHM 8134)

**Spectroscopy for Organic Chemists**  
Analysis of proton NMR spectra. Fourier transform <sup>13</sup>C NMR, strategies for structure elucidation, relaxation times, two-dimensional NMR. Aspects of mass spectrometry. Also offered at the undergraduate level, with different requirements, as CHEM 4202, for which additional credit is precluded.

CHEM 5408 [0.25 credit] (CHM 8350)

**Introduction to Polymer Structure and Morphology**

Flexible and rigid rod polymers: effect of molecular constitution and conformation; examples of polymer architectures and function; the amorphous state and glass transition; the crystalline state: typical crystal structures of polymers; polymorphism; crystallinity and long spacing. Thermal and solvent-induced crystallization; Lamellar and Spherulitic morphology.

CHEM 5409 [0.25 credit] (CHM 8351)

**Morphology of Polymers and Composites**

Liquid crystalline state of polymers; morphology of block copolymers and polymer blends; plasticizers and fillers for tailoring properties; depression of glass transition and melting temperature; phase stability of polymer composites; mechanical properties; self assembled systems; polymer nano-composites for electronic devices; common experimental techniques.

CHEM 5500 [0.25 credit] (CHM 8348)

**Analytical Instrumentation**

Principles of modern electronics, devices and instruments. Measurement of photonic and electrochemical signals. Conditioning of signals for feedback control and microcomputer interfacing. Computational data analysis techniques such as simplex optimization. Applications in chemical analysis include amperometric detector for capillary electrophoresis, and surface plasmon resonance immunosensor.

CHEM 5501 [0.25 credit] (CHM 8352)

**Analytical Approach to Chemical Problems**

Case study of analytical approach to various chemical problems in agricultural, biochemical, environmental, food processing, industrial, pharmaceutical and material sciences. Analytical methods include capillary electrophoresis, chemiluminescence, Fourier transform infrared spectroscopy, inductively coupled plasma emission spectroscopy, mass spectrometry, biochemical sensors, and fibre optics for remote sensing.

CHEM 5503 [0.5 credit] (CHM 8354)

**Chemical Speciation in the Natural Environment**

Metal-organic interactions in the aquatic environment. Evaluation of analytical techniques and their capability for quantitative determination of chemical species (as opposed to total element-determination) in the natural environment. Electrochemical techniques for determination of chemical speciation of nutrient and toxicant elements present in the natural environment.

CHEM 5705 [0.5 credit] (CHM 9109)

**Ecotoxicology**

Concepts of ecotoxicology, emphasizing whole ecosystem response to hazardous contaminants. Impacts of chronic and acute exposure of ecosystems to toxicants, the methods of pesticide, herbicide and pollutant residue analysis and the concept of bound residues. (Also listed as BIOL 6403 [BIO 9104].) Prerequisite: BIOL 6402 (BIO 9101)/CHEM 5708 (CHM 8156).

CHEM 5708 [0.5 credit] (CHM 8156)

**Principles of Toxicology**

Basic theorems of toxicology with examples of current research problems. Toxic risk is defined as the product of intensive hazard and research problems. Each factor is assessed in scientific and social contexts and illustrated with many types of experimental material. (Also listed as BIOL 6402 [BIO 9101].)

CHEM 5709 [0.5 credit] (CHM 8157)

**Chemical Toxicology**

Introduction to modeling chemical hazards and exposures at the cellular level. The properties of toxic substances are compared to the responses of enzymatic systems. These interactions are defined as Quantitative Structure-Activity Relationships and used to interpret hazardous materials under regulations such as WHMIS. (Also listed as BIOL 5709 [BIO 8113].)

Prerequisite: BIOL 6402/CHEM 5708 (BIO 9101/CHM 8156).

CHEM 5801 [1.0 credit] (CHM 8256)

**Seminar I**

A seminar course in which students are required to present a seminar on a topic not related to their research program. In addition, students are required to attend the seminars of their fellow classmates and actively participate in the discussion following the seminar.

CHEM 5802 [1.0 credit] (CHM 8257S)

**Seminar II**

A seminar course in which students are required to present a seminar on their Ph.D. research topic in their research program. In addition, students are required to attend the seminars of their fellow classmates and actively participate in the discussion following the seminar.

CHEM 5805 [1.0 credit] (CHM 8167)

**Seminar in Toxicology**

This course introduces the seminar format and involves student, faculty and invited seminar speakers. The student will present a seminar and submit a report on a current topic in toxicology. (Also listed as BIOL 6405.)

CHEM 5900 [0.5 credit] (CHM 8158)

**Directed Special Studies**

Under unusual circumstances and with the recommendation of the research supervisor, it is possible to engage in directed study on a topic of particular value to the student. This may also be used for credit if there are insufficient course offerings in a particular field.

CHEM 5901 [0.25 credit] (CHM 8304)

**Advanced Topics in Organic Chemistry**

Topics of current interest in organic chemistry. The content of this course may vary from year to year.

CHEM 5902 [0.25 credit] (CHM 8302)

**Advanced Topics in Inorganic Chemistry**

Topics of current interest inorganic chemistry. The content of this course may vary from year to year.

CHEM 5903 [0.25 credit] (CHM 8309)

**Advanced Topics in Physical/Theoretical Chemistry**

Topics of current interest in physical/theoretical chemistry. The content of this course may vary from year to year.

CHEM 5904 [0.5 credit] (CHM 8104)

**Scientific Data Processing and Evaluation**

Optimization of scientific measurements, calibration, uni-variate and multi-variate analysis of scientific data, "intelligent" spreadsheets for scientific data processing and presentation, noise reduction using spreadsheets, correction for signal drifts; examples from chemistry, spectroscopy and other scientific disciplines.

Prerequisites: CHEM 4301, or permission from the Department. Also offered at the undergraduate level, with different requirements, as CHEM 4303 for which additional credit is precluded.

CHEM 5905 [0.5 credit] (CHM 5105)

**Radiochemistry**

A study of nuclear stability and decay; chemical studies of nuclear phenomena. Applications of radioactivity.

Also offered at the undergraduate level, with different requirements, as CHEM 4502 for which additional credit is precluded.

Prerequisite: permission of the Department.

CHEM 5909 (CHM 7999)

**M.Sc. Thesis**

CHEM 6909 (CHM 9999)

**Ph.D. Thesis**

## Civil Engineering (CIVE)

### Department of Civil and Environmental Engineering

CIVE 5101 [0.5 credit](CVG 7120)

#### Introductory Elasticity

Stresses and strains in a continuum; transformations, invariants; equations of motion; constitutive relations, generalized Hooke's Law, bounds for elastic constant: strain energy, superposition, uniqueness; formulation of plane stress and plane strain problems in rectangular Cartesian and curvilinear coordinates, Airy-Mitchell stress functions and Fourier solutions.

CIVE 5102 [0.5 credit] (CVG 7121)

#### Advanced Elasticity

Continuation of topics introduced in CIVE 5101.

Complex variable solutions: torsional and thermal stresses; axially symmetric three-dimensional problems, Love's strain potential, Boussinesq-Galerkin stress functions; problems related to infinite and semi-infinite domains. Introduction to numerical methods of stress analysis, comparison of solutions.

Prerequisite: CIVE 5101 or permission of the Department.

CIVE 5103 [0.5 credit] (CVG 7122)

#### Finite Element Analysis 1

Stress-strain and strain-displacement relationships from elasticity. Plane stress and plane strain finite elements. Lagrange interpolation and Lagrange based element families. Theory of thin plates; overview of plate bending elements. Theory of shells; practical shell elements. Finite element methods formulation. Also offered at the undergraduate level, with different requirements, as CIVE 4201, for which additional credit is precluded.

CIVE 5104 [0.5 credit] (CVG 7123)

#### Earthquake Engineering

Advanced vibration analysis techniques; Rayleigh-Ritz procedure; subspace iteration; derived Ritz coordinates; proportional and non-proportional damping; introduction to seismology; earthquake response analysis via time and frequency domain; response spectrum approach; multiple input excitations; design considerations and code requirements; other advanced topics in earthquake engineering.

Prerequisite: CIVE 5106 or permission of the Department.

CIVE 5105 [0.5 credit] (CVG 7124)

#### Finite Element Analysis 2

Variational and Galerkin formulations: assumed displacement, assumed stress and hybrid elements; plate bending: convergence, completeness and conformity, patch test, Kirchhoff and Mindlin plate theories, nonlinear elasticity and plasticity; geometric non-linearity, Eulerian and Lagrangian formulations; incremental and iterative schemes, finite elements in dynamics.

Prerequisite: CIVE 5103 or permission of the Department.

CIVE 5106 [0.5 credit] (CVG 7137)

#### Dynamics of Structures

Structural dynamics, single and multi-degree-of-freedom systems, formulation of equations of motion, methods of analytical mechanics, free and forced vibrations, normal mode analysis, numerical methods for the response analyses of single and multiple-degree-of-freedom systems.

CIVE 5200 [0.5 credit] (CVG 7138)

#### Masonry Behaviour and Design

Properties of masonry materials and assemblages. Behaviour and design of walls, columns and lintels. Treatment of specialized design and construction topics. Design of lowrise and highrise structures. Discussion of masonry problems. Emphasis on a practice-oriented approach.

Also offered at the undergraduate level, with different requirements, as CIVE 4403, for which additional credit is precluded.

CIVE 5203 [0.5 credit] (CVG 7125)

#### Theory of Structural Stability

Elastic and inelastic behaviour of beam-columns; elastic and inelastic buckling of frames; application of energy methods to buckling problems; lateral-torsional buckling of columns and beams; buckling of plates; local buckling of columns and beams.

Prerequisite: CIVE 5205 or equivalent.

CIVE 5204 [0.5 credit] (CVG 7126)

#### Advanced Steel Structures

Limit states design philosophy; material behaviour; tension members; plate buckling; torsion; lateral torsional buckling; beams, axially loaded columns and beam-column behaviour; brittle fracture and fatigue; frame stability and second order effects.

CIVE 5205 [0.5 credit] (CVG 7127)

#### Advanced Structural Analysis

Matrix structural analysis; force and displacement method of analysis for planar and space structures; symmetric and anti-symmetric structures; analysis of nonlinear structures: geometric and material nonlinearities; large displacement theory and iteration strategy.

CIVE 5206 [0.5 credit] (CVG 7128)

#### Prestressed Concrete

Prestressed concrete materials; working stress design for flexure; ultimate strength design for flexure, shear, and torsion; prestress losses; deflection and camber; slabs; indeterminate beams and frames; introduction to prestressed bridges and circular tanks.

CIVE 5208 [0.5 credit] (CVG 7130)

#### Advanced Reinforced Concrete

The research background, development, and limitations in current building code provisions for reinforced concrete; yield line theory of slabs; safety and limit state design; computer design of concrete structures.

CIVE 5209 [0.5 credit] (CVG 7100)

#### Geotechnical Case Studies

The critical study of case histories relating to current procedures of design and construction in geotechnical engineering. The importance of instrumentation and monitoring field behaviour will be stressed. In-situ testing.

CIVE 5300 [0.5 credit] (CVG 7101)

#### Advanced Soil Mechanics

Effective stress, pore pressure parameters, saturated and partially saturated soils; seepage; permeability tensor, solutions of the Laplace equation; elastic equilibrium; anisotropy, non-homogeneity, consolidation theories; shear strength of cohesive and cohesionless soils; failure and yield criteria.

CIVE 5303 [0.5 credit] (CVG 7103)

#### Pavements and Materials

An analysis of the interaction of materials, traffic, and climate in the planning, design construction, evaluation, maintenance, and rehabilitation of highway and airport pavements.



CIVE 5304 [0.5 credit] (CVG 7150)

**Intercity Transportation**

Current modal and intermodal issues, including energy. Framework and process of intercity transport planning and management. Recent trends and system development. Passenger and freight demand and service characteristics. Future prospects and possibilities.

CIVE 5305 [0.5 credit] (CVG 7151)

**Traffic Engineering**

Introduction to principles of traffic engineering. Basic characteristics of drivers, vehicles, and traffic. Volume, speed, and delay studies. Traffic stream characteristics and queuing theory. Capacity analysis of roads and intersections. Safety.

CIVE 5306 [0.5 credit] (CVG 7152)

**Highway Materials**

Materials characterization and strength evaluation of soils, stabilized soils, aggregates, and asphalt concrete. Effects of low temperatures and frost on materials behaviour.

CIVE 5307 [0.5 credit] (CVG 7153)

**Urban Transportation**

Urban transportation systems, planning and management. Urban development models, an introduction. Urban transportation policy.

CIVE 5308 [0.5 credit] (CVG 7154)

**Highway Geometric Design**

Principles of highway geometric design. Components of the highway system, their interrelationships, abilities, limitations, and their relations with the design elements. Safety and human factors, and their interaction with the highway elements. New and evolving concepts.

CIVE 5309 [0.5 credit] (CVG 7155)

**Transportation Supply**

Advanced treatment of transportation planning and management concepts and techniques: transport supply issues, capacity and costs, evaluation of system improvements and extensions, transportation and development, policy impact analysis.

CIVE 5401 [0.5 credit] (CVG 7156)

**Transportation Economics**

Transportation, economic analysis framework. Transport industry output. Carrier operations. Issue of resource utilization, measurement, economics, supply of infrastructure, pricing; subsidies, externalities. Transport policy in Canada.

CIVE 5402 [0.5 credit] (CVG 7159)

**Transportation Terminals**

Framework for passenger terminal planning and design. Theory: the transfer function and network modeling; pedestrian flow characteristics; capacity of corridors, stairs, escalators, and elevators; layout planning. Practical applications: air, rail, metro, bus, ferry, and multi-modal terminals.

CIVE 5403 [0.5 credit] (CVG 7158)

**Airport Planning**

Framework for airport planning and design. Aircraft characteristics; demand forecasting; airport site selection; noise, airside capacity; geometric design; the passenger terminal complex; cargo area; general aviation; ground transportation; land use planning.

CIVE 5500 [0.5 credit] (CVG 7104)

**Earth Retaining Structures**

Approaches to the theoretical and semi-empirical analysis of earth retaining structures. Review of the earth pressure theories. Analysis and design methods for rigid and flexible retaining walls, braced excavations, and tunnels. Instrumentation and performance studies.

CIVE 5501 [0.5 credit] (CVG 7105)

**Advanced Foundation Engineering**

Review of methods of estimating compression and shear strength of soils. Bearing capacity of shallow and deep foundations. Foundations in slopes. Pile groups. Use of in-situ testing for design purposes.

CIVE 5502 [0.5 credit] (CVG 7106)

**In-Situ Geotechnique**

Subsurface exploration program. Soil and rock sampling. Geo-physical methods. Mechanical and hydraulic properties of soil and rock. Determination of strength and deformability. Critical evaluation of vane, pressuremeter, screw plate, dilatometer, borehole shear and plate load tests. Pumping, recharge and packer tests. In-situ stress measurements.

CIVE 5503 [0.5 credit] (CVG 7107)

**Numerical Methods in Geomechanics**

Advanced theories of soil and rock behaviour. Plasticity models. Generalized failure criteria. Critical state and cap models. Dilatancy effects. Associative and non-associative flow rules. Hardening rules. Consolidation, visco-elasticity, creep behaviour. Finite element formulation. Iterative schemes. Time marching schemes. Solution of typical boundary value problems.  
Prerequisite: CIVE 5101, CIVE 5103, or permission of the Department.

CIVE 5504 [0.5 credit] (CVG 7108)

**Seepage through Soils**

Surface-subsurface water relations. Steady flow. Flownet techniques. Numerical techniques. Seepage analogy models. Anisotropic and layered soils. Water retaining structures. Safety against erosion and piping. Filter design. Steady and non-steady flow towards wells. Multiple well systems. Subsidence due to ground water pumping.  
Precludes additional credit for ENVE 5301.

CIVE 5505 [0.5 credit] (CVG 7109)

**Geotechnical Earthquake Engineering**

Seismic hazards, earthquakes and ground motion, wave propagation, ground response analysis, soil properties for dynamic analysis: laboratory tests, in-situ tests, modulus and damping curves, liquefaction susceptibility, post liquefaction response, seismic effects on slope stability, retaining structures.  
Precludes additional credit for CIVE 5801 (2001-2003).

CIVE 5600 [0.5 credit] (CVG 7131)

**Project Management**

Managing building development, design, and construction including interrelationships among owners, developers, financing sources, designers, contractors, and users; project manager role and tasks; project objectives; feasibility analyses; budgets and financing; government regulations; environmental and social constraints; cost, time, and content quality controls and processes; human factors.

CIVE 5601 [0.5 credit] (CVG 7140)

**Engineering, Statistics, and Probabilities**

Review of basic concepts in statistics and probabilities. Bayes' Theorem. Distributions. Parameter estimation. Goodness-of-fit. Regression and correlation. OC curves. Monte Carlo simulation. ANOVA. Probability-based design criteria. System reliability. Selected applications in structures, transportation and geomechanics. Use of computer software. Emphasis on problem solving.

CIVE 5602 [0.5 credit] (CVG 7141)

**Advanced Computer-Aided Design**

Representation and processing of design constraints (such as building codes and other design rules); decision tables; constraint satisfaction. Automatic integrity and consistency maintenance of design databases; integrated CAD systems. Introduction to geometric modeling. Introduction to artificial intelligence. Also offered at the undergraduate level, with different requirements, as CIVE 4500, for which additional credit is precluded.

CIVE 5605 [0.5 credit] (CVG 7143)

**Design of Steel Bridges**

Basic features of steel bridges, design of slab-on-girder, box girder and truss bridges. Composite and non-composite design. Introduction to long span suspension and cable-stayed bridges. Discussion of relevant codes and specifications.

CIVE 5606 [0.5 credit] (CVG 7144)

**Design of Concrete Bridges**

Concrete and reinforcing steel properties, basic features of concrete bridges, design of superstructure in reinforced concrete slab, slab-on-girder and box girder bridges, an introduction to prestressed concrete bridges, design of bridge piers and abutments. In all cases the relevant provisions of Canadian bridge codes are discussed.

CIVE 5607 [0.5 credit] (CVG 7145)

**Introduction to Bridge Design**

Limit states design of highway bridges; methods of analysis, design and evaluation procedures of superstructure components; design codes; design loads and load factors; concrete deck design; load distributions; computer analysis; impact and dynamics; fatigue and brittle fracture; construction bracing; load capacity rating of existing bridges.

CIVE 5609 [0.5 credit] (CVG 7170)

**Fundamentals of Fire Safety Engineering**

The fire safety system, including social, economic and environmental issues; description of the fire safety regulatory system and the governing building codes and standards. This includes the global fire safety system in a facility and active fire protection systems; detection, suppression, smoke management. Precludes additional credit for CIVE 5707 (2001-2002).

CIVE 5610 [0.5 credit] (CVG 7171)

**Fire Dynamics I**

Fundamentals of combustion including material and energy balances, chemical thermodynamics, kinetics, premixed and diffusive burning. Advanced topics in the theory of combustion, flame propagation, efficiency of combustion, and the physico-chemical properties of combustible material. Precludes additional credit for CIVE 5705 (2001-2003).

CIVE 5611 [0.5 credit] (CVG 7173)

**People in Fires**

Review of the work presented by the founders in the field of human behaviour in fire. Introduction to the basic notions of perception, cognition, information processing, decision-making and problem solving. Behavioural concepts such as panic, commitment, affiliation, familiarity and role are discussed. Precludes additional credit for CIVE 5708 (2001-2003).

CIVE 5612 [0.5 credit] (CVG 7174)

**Fire Modeling**

Fire modeling and its role in fire safety engineering. Review of the main modeling techniques used in Fire Safety Engineering; network, zone and Computational Fluid Dynamics (CFD). Precludes additional credit for CIVE 5802 (2002-2003).

CIVE 5613 [0.5 credit] (CVG 7172)

**Fire Dynamics II**

Fire dynamics from ignition through heat transfer to growth and spread of fires and their suppression. Factors such as containment and its role in the dynamics of fires and explosions are covered. Precludes additional credit for CIVE 5803 (2002-2003). Prerequisite: CIVE 5610 Fire Dynamics I.

CIVE 5614 [0.5 credit] (CVG 7175)

**Design for Fire Resistance**

Behaviour of materials and structures at elevated temperatures; fire-resistance tests; fire-resistance ratings; building code requirements; real-world fires; assessing the fire resistance of steel, concrete and wood building assemblies. Precludes additional credit for CIVE 5709 (2001-2003).

CIVE 5705 [0.5 credit] (CVG 7300)

**Topics in Structures**

Courses in special topics related to building design and construction, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5706 [0.5 credit] (CVG 7301)

**Topics in Structures**

Courses in special topics related to building design and construction, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5707 [0.5 credit] (CVG 7302)

**Topics in Structures**

Courses in special topics related to building design and construction, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5708 [0.5 credit] (CVG 7303)

**Topics in Structures**

Courses in special topics related to building design and construction, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5709 [0.5 credit] (CVG 7304)

**Topics in Structures**

Courses in special topics related to building design and construction, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5800 [0.5 credit] (CVG 7305)

**Topics in Geotechnique**

Courses in special topics in geotechnical engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5801 [0.5 credit] (CVG 7306)

**Topics in Geotechnique**

Courses in special topics in geotechnical engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5802 [0.5 credit] (CVG 7307)

**Topics in Geotechnique**

Courses in special topics in geotechnical engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5803 [0.5 credit] (CVG 7308)

**Topics in Geotechnique**

Courses in special topics in geotechnical engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5804 [0.5 credit] (CVG 7309)

**Topics in Geotechnique**

Courses in special topics in geotechnical engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5805 [0.5 credit] (CVG 7310)

**Topics in Transportation**

Courses in special topics in transportation engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5806 [0.5 credit] (CVG 7311)

**Topics in Transportation**

Courses in special topics in transportation engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5807 [0.5 credit] (CVG 7312)

**Topics in Transportation**

Courses in special topics in transportation engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5808 [0.5 credit] (CVG 7313)

**Topics in Transportation**

Courses in special topics in transportation engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5809 [0.5 credit] (CVG 7314)

**Topics in Transportation**

Courses in special topics in transportation engineering, not covered by other graduate courses; details will be available some months prior to registration.

CIVE 5900 [1.0 credit]

**Civil Engineering Project**

Students enrolled in the M.Eng. program by course work will conduct an engineering study, analysis, or design project under the general supervision of a member of the Department.

CIVE 5901 [0.0 credit]

**Master's Seminar**

The series consists of presentations by graduate students or external speakers. Graduate students in the Civil Engineering program are required to participate in these seminar series by attending all seminars and making at least one presentation during their graduate studies.

CIVE 5906 [0.5 credit]

**Directed Studies 1**

CIVE 5907 [0.5 credit]

**Directed Studies 2**

CIVE 5909 [3.0 credits]

**M.A.Sc. Thesis**

CIVE 6901 [0.0 credit]

**Ph.D. Seminar**

The series consists of presentations by graduate students or external speakers. Graduate students in the Civil Engineering program are required to participate in these seminar series by attending all seminars and making at least one presentation during their graduate studies.

CIVE 6909 [8.0 credits]

**Ph.D. Thesis**

## Cognitive Science (CGSC)

### Institute of Cognitive Science

CGSC 5001 [0.5 credit]

#### **Cognition and Artificial Cognitive Systems**

An introduction to the contribution of artificial intelligence and computer modeling of cognitive processes to cognitive science.

CGSC 5002 [0.5 credit]

#### **Experimental Research in Cognition**

An introduction to the contribution of experimental psychology and neuroscience to cognitive science.

CGSC 5003 [0.5 credit]

#### **Cognition and Language**

An introduction to the contribution of theoretical linguistics and linguistic research to cognitive science.

CGSC 5004 [0.5 credit]

#### **Cognition and Conceptual Issues**

An introduction to the contribution of philosophy of mind, philosophy of language, and other conceptual investigations to cognitive science.

CGSC 5005 [0.5 credit]

#### **Cognition and Neuroscience**

An introduction to the contribution of neuroscience to cognitive science.

CGSC 5100 [0.5 credit]

#### **Issues in Cognitive Science**

A survey of the central problems and issues of cognitive research to start the process of acquiring the interdisciplinary breadth required to understand research in cognitive science.

CGSC 5101 [0.5 credit]

#### **Experimental Methods and Statistics**

An introduction to the design of experiments and the statistics needed to interpret data in cognitive science.

CGSC 5102 [0.5 credit]

#### **Computational Methods**

An introduction to the basic computational skills necessary for cognitive science research.

CGSC 5303 [0.5 credit]

#### **Linguistic Analysis, Culture and Cognition**

Universals of language from a cross-cultural perspective. Study of lesser-known languages leading to critical understanding of universal human concepts and communication practices in culture-specific configurations. Cross-linguistic analysis as a means to general understanding of diversity and universality in human cognition.

CGSC 5901 [0.5 credit]

#### **Special Topics in Cognitive Science**

Seminar on current, important issues related to Cognition and Neuroscience, Philosophy, Computer Science, Linguistics and/or Psychology. Topics will vary from year to year.

CGSC 5907 [0.5 credit]

#### **Independent Research**

Permission to register and approval of research plan must be obtained from the graduate supervisor. A final research report must be filed in the departmental office prior to submission of course grade. The course may be repeated for credit.

CGSC 5908 [1.0 credit]

#### **Research Project**

Students may enroll in multiple sections of this course (as necessary) to complete their Research credits.

CGSC 5909 [2.5 credits]

#### **M. Cog. Thesis**

CGSC 6001 [0.5 credit]

#### **Theory and Methods of Cognitive Science**

Introduction to the main epistemological issues in cognitive science and to the diverse methods that researchers use to study cognition.

CGSC 6002 [0.5 credit]

#### **Methodology Rotation I**

Students spend one term in a laboratory or other research venue using a method for studying cognition (behavioural, linguistic-theoretic, computational, conceptual, neuroscientific). Assignments will be as specified by each rotation supervisor.

CGSC 6003 [0.5 credit]

#### **Methodology Rotation II**

Students spend one term in a laboratory or other research venue using a different method for studying cognition (behavioural, linguistic-theoretic, computational, conceptual, neuroscientific). Assignments will be as specified by each rotation supervisor.

CGSC 6004 [0.5 credit]

#### **Cognitive Modelling for Cognitive Science**

Introduction to the field of cognitive modelling. Different modelling systems and how to evaluate them against human data; how to create cognitive models using the ACT-R cognitive architecture. Lectures three hours per week.

CGSC 6501 [0.5 credit]

#### **Special Topics in Cognitive Science**

Seminar course on a topic of interest to students in Cognitive Science. Topics will vary from year to year. Lectures three hours per week.

CGSC 6800 [1.0 credit]

#### **Proseminar in Cognitive Science**

An intensive survey of the central problems and issues of natural and artificial cognition and a brief examination of contemporary neuroscience. Compulsory in the first year of registration.

CGSC 6901 [0.5 credit]

#### **Directed Studies in Cognitive Science I**

CGSC 6902 [0.5 credit]

#### **Directed Studies in Cognitive Science II**

CGSC 6909

#### **Ph.D. Thesis**



## Communication Studies (COMM)

### School of Journalism and Communication

COMM 5101 [1.0 credit]

#### **Foundations of Communication Studies**

Examines the origins and traditions of modern communication studies with attention to theoretical and methodological aspects of developments and debates shaping current communication research.

COMM 5200 [0.5 credit]

#### **Communication and Citizenship**

Examines the role of communication in relation to the emergence, development, and problematization of citizenship within civil society and the public sphere.

COMM 5202 [0.5 credit]

#### **History and Theory of Persuasion**

Examines various efforts to discover and apply techniques of successful persuasion from classical rhetoric to scientific public opinion research with attention to contemporary political, public information, and corporate campaigns.

COMM 5203 [0.5 credit]

#### **Communication, Technology, and Society**

Examines the technological context of social communication in terms of human agency, medium theory, and the idea of progress.

COMM 5204 [0.5 credit]

#### **Media, Culture, and Policy**

Examines policy-making as a form of communication from a variety of perspectives, with a focus on the strategies and negotiations that precede policy representation.

COMM 5206 [0.5 credit]

#### **Communication, Culture, and Regulation**

Examines the role of law, moral regulation, and other social means of control in media and cultural practices in areas such as intellectual property, consumerism, and public health.

COMM 5208 [0.5 credit]

#### **Entertainment Studies**

Examines the ways in which entertainment media, audiences, and popular culture shape and reflect social relations in contexts such as movie theatres, tabloids, fanzines, and fashion.

COMM 5210 [0.5 credit]

#### **Communication and Taste**

Examines classical and contemporary theories of taste and their implications for communication. Attention is paid to the role of communication in shaping taste and its classificatory schemata.

COMM 5212 [0.5 credit]

#### **Communication and Everyday Life**

Examines the role of communication within everyday environments ranging from the psychical domain of the self to the worlds of architecture, sound, and etiquette.

COMM 5214 [0.5 credit]

#### **Communication and Globalization**

Examines globalization and communication in the context of international communication history, cultural imperialism, transnational regulation, media integration, and diasporic networks.

COMM 5216 [0.5 credit]

#### **Communication and Empire**

Examines various interpretations of the role of communication in the development of empires and the modern world order.

COMM 5218 [0.5 credit]

#### **Special Studies of Media**

Examines a particular traditional or non-traditional medium of communication. Topic will vary from year to year.

COMM 5509 [0.5 credit]

#### **Media, Culture, and Gender**

Examines various theoretical debates on the production and reproduction of gender relations through communication processes and institutions, and addresses current research issues in feminist and other gender-based approaches to culture and communication.

COMM 5605 [0.5 credit]

#### **Approaches to Communication Research**

Examines the processes of conducting communication research in the context of writing a thesis or research essay. Considers topic selection, question framing, research design, the use of theory, and specific methodologies such as content analysis, discourse analysis, survey research, ethnography, semiotics, and historical analysis.

COMM 5808 [0.5 credit]

#### **Directed Studies**

Directed research or readings on a topic area not covered in that year's course offerings.

COMM 5908 [1.0 credit]

#### **Research Essay**

COMM 5909 [2.0 credits]

#### **M.A. Thesis**

COMM 6000 [1.0 credit]

#### **Doctoral Seminar in Communication Studies**

A seminar leading to the first comprehensive encompassing the program's three fields of concentration: the history of communication as object and field of study, the political economy of communication, and socio-cultural analysis of communication.

COMM 6001 [0.5 credit]

#### **Selected Topics in Communication**

Examines a newly emerging issue, research method, or theory related to communication. Topic will vary from year to year.

COMM 6005 [0.5 credit]

#### **Communication and History**

Examines the history of communication and its conceptualization from various perspectives as well as the way in which historical events arise through communication.

COMM 6006 [0.5 credit]

#### **Political Economy of Communication**

Examines the history of political economy with particular attention to applications in the field of communication.

COMM 6007 [0.5 credit]

#### **Communication, Discourse, and Representation**

Examines the processes and practices of representation through which meanings arise.

COMM 6010 [0.5 credit]

#### **Directed Studies**

Directed research or readings on a topic area not covered in that year's course offerings.

COMM 6900 [1.0 credit]

#### **Comprehensive Examination I**

Examination normally conducted in May of each year in connection with COMM 6000 and covering the program's three fields of concentration: the history of communication as object and field of study; the political economy of communication; and the socio-cultural analysis of communication. Graded as Satisfactory or Unsatisfactory.

Graduate Courses - Communication Studies (COMM)

COMM 6901 [1.0 credit]

**Comprehensive Examination II**

Examination by the student's thesis supervisor and committee of an approved project related to a particular field of communication research; the field may or may not be related to the student's thesis. Graded as Satisfactory or Unsatisfactory.

COMM 6909 [5.0 credits]

**Ph.D. Thesis**

## Comparative Literary Studies (CLST)

### Institute for Studies in Literature, Art, and Culture (ICSLAC)

CLST 6001 [0.5 credit]

#### Doctoral Seminar I: Literature and Other Discourses

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6002 [0.5 credit]

#### Doctoral Seminar II: Literature and Other Discourses

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6003 [0.5 credit]

#### Modernism

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6004 [0.5 credit]

#### Postmodernism

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6100 [0.5 credit]

#### Narrative and Non-Fiction

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6200 [0.5 credit]

#### Literary History

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6205 [0.5 credit]

#### Hermeneutics and Aesthetic Experiences of Literature

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6300 [0.5 credit]

#### Text Theory

Topic may vary from year to year. (Also listed as ENGL 5000.)

Prerequisite: permission of Comparative Literary Studies.

CLST 6305 [0.5 credit]

#### Translation Studies: Theory and Practice

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6400 [0.5 credit]

#### Gender and Literature

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6500 [0.5 credit]

#### Rhetoric and Literature

Topic may vary from year to year.

Prerequisite: permission of Comparative Literary Studies.

CLST 6505 [0.5 credit]

#### Iconicity and Medieval and Early Renaissance Literature

Topic may vary from year to year.

Prerequisite: permission of Comparative Literary Studies.

CLST 6600 [0.5 credit]

#### Sign, Language and Society

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6803 [0.5 credit]

#### Seminar in Comparative Literary Studies

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6804 [0.5 credit]

#### Seminar in Comparative Literary Studies

Topic may vary from year to year. Students should consult Comparative Literary Studies regarding the topic offered.

CLST 6903 [1.0 credit]

#### Comprehensives

CLST 6909

#### Ph.D. Thesis

## Computer Science (COMP)

### School of Computer Science

COMP 5001 [0.5 credit] (CSI 5113)

#### Foundations of Programming Languages

Advanced study of programming paradigms from a practical perspective. Paradigms may include functional, imperative, concurrent, distributed, generative, aspect- and object-oriented, and logic programming. Emphasis on underlying principles. Topics may include: types, modules, inheritance, semantics, continuations, abstraction and reflection. Prerequisite: COMP 3007 or the equivalent.

COMP 5002 [0.5 credit] (CSI 5128)

#### Swarm Intelligence

Collective computation, collective action, and principles of self-organization in social agent systems. Algorithms for combinatorial optimization problems, division of labour, task allocation, task switching, and task sequencing with applications in security, routing, wireless and ad hoc networks and distributed manufacturing.

COMP 5003 [0.5 credit] (CSI 5308)

#### Principles of Distributed Computing

Formal models; semantics of distributed computations; theoretical issues in design of distributed algorithms; computational complexity; reducibility and equivalence of distributed problems. Related topics: systolic systems and computations, oligarchical systems and control mechanisms.

COMP 5005 [0.5 credit] (CSI 5390)

#### Learning Systems for Random Environments

Computerized adaptive learning for random environments and its applications. Topics include a mathematical review, learning automata which are deterministic/stochastic, with fixed/variable structures, of continuous/discretized design, with ergodic/absorbing properties and of estimator families. Prerequisite: MATH 2600 or MATH 3500, or SYSC 5503 or equivalent.

COMP 5008 [0.5 credit] (CSI 5164)

#### Computational Geometry

Study of design and analysis of algorithms to solve geometric problems; emphasis on applications such as robotics, graphics, and pattern recognition. Topics include: visibility problems, hidden line and surface removal, path planning amidst obstacles, convex hulls, polygon triangulation, point location. Prerequisite: COMP 3804 or equivalent.

COMP 5009 [0.5 credit] (CSI 5141)

#### Associative Data Structures and Advanced Databases

Concepts and advanced topics in the design, implementation and analysis of physical storage schemes with emphasis on their application to specialized database and information retrieval systems. Topics include: associative searching techniques; multidimensional storage structures; algorithms for spatial data modeling; formulation and optimization of database queries. Prerequisites: COMP 3005 and COMP 3804, or the equivalent.

COMP 5100 [0.5 credit] (CSI 5180, CSI 5580)

#### Topics in Artificial Intelligence

Areas in knowledge-based systems including recent approaches to machine learning and data mining, inference methods, knowledge-based and fuzzy systems, heuristic search, and natural language processing. Precludes additional credit for COMP 4106. Prerequisite: COMP 3007 or equivalent.

COMP 5101 [0.5 credit] (CSI 5311)

#### Distributed Databases and Transaction Processing Systems

Principles in the design and implementation of distributed databases and distributed transaction processing systems. Topics include: distributed computing concepts, computing networks, distributed and multi-database system architectures and models, atomicity, synchronization and distributed concurrency control algorithms, data replication, recovery techniques, reliability in distributed databases.

Precludes additional credit for COMP 4101.

Prerequisites: COMP 3005, COMP 4001, and COMP 4003 or equivalent.

COMP 5102 [0.5 credit] (CSI 5312)

#### Distributed Operating Systems

Design issues of advanced multiprocessor distributed operating systems: multiprocessor system architectures; process and object models; synchronization and message passing primitives; memory architectures and management; distributed file systems; protection and security; distributed concurrency control; deadlock; recovery; remote tasking; dynamic reconfiguration; performance measurement, modeling, and system tuning.

Prerequisite: COMP 3000 and COMP 3203 or equivalent.

COMP 5104 [0.5 credit] (CSI 5314)

#### Object-Oriented Software Development

Issues in modeling and verifying quality and variability in object-oriented systems. Testable models in model-driven and test-driven approaches. System family engineering. Functional conformance: scenario modeling and verification, design by contract. Conformance to non functional requirements: goals, forces and tradeoffs, metrics. Prerequisite: COMP 2004 or equivalent.

COMP 5106 [0.5 credit] (CSI 5123)

#### Languages for Parallel Computing

Survey of major language paradigms for parallel computing: sequential imperative, parallel imperative, logic, functional (reduction and dataflow), object and message-passing based languages; communicating sequential processes; and massive data-level parallelism. Topics include detection, determinism, data partitioning, task scheduling, task granularity, synchronization methods, resource management, and debugging.

Prerequisite: COMP 5001.

COMP 5107 [0.5 credit] (CSI 5185)

#### Statistical and Syntactic Pattern Recognition

Topics include a mathematical review, Bayes decision theory, maximum likelihood and Bayesian learning for parametric pattern recognition, non-parametric methods including nearest neighbor and linear discriminants. Syntactic recognition of strings, substrings, subsequences and tree structures. Applications include speech, shape and character recognition.

Prerequisite: permission of the School.

COMP 5203 [0.5 credit] (CSI 5173)

#### Data Networks

Mathematical and practical aspects of design and analysis of communication networks. Topics include: basic concepts, layering, delay models, multi-access communication, queuing theory, routing, fault-tolerance, and advanced topics on high-speed networks, ATM, mobile wireless networks, and optical networks.

Prerequisite: COMP 4804 or permission of the School.



COMP 5204 [0.5 credit] (CSI 5124)

**Computational Aspects of Geographic Information Systems**

Computational perspective of geographic information systems (GIS). Data representations and their operations on raster and vector devices: e.g., quadtrees, grid files, digital elevation models, triangular irregular network models. Analysis and design of efficient algorithms for solving GIS problems: visibility queries, point location, facility location.

Prerequisite: COMP 3804 or the equivalent.

COMP 5206 [0.5 credit] (CSI 5183)

**Evolutionary Computation and Artificial Life**

Study of algorithms based upon biological theories of evolution, applications to machine learning and optimization problems. Possible topics: Genetic Algorithms, Classifier Systems, and Genetic Programming. Recent work in the fields of Artificial Life (swarm intelligence, distributed agents, behavior-based AI) and of connectionism.

Prerequisites: COMP 3007 or the equivalent.

Precludes: COMP 4107 or the equivalent.

COMP 5305 [0.5 credit] (CSI 5129)

**Advanced Database Systems**

In-depth study on developments in database systems shaping the future of information systems, including complex object, object-oriented, object-relational, and semi-structured databases. Data structures, query languages, implementation and applications.

Prerequisites: COMP 3005 or the equivalent.

COMP 5306 [0.5 credit] (CSI 5100)

**Data Integration**

Materialized and virtual approaches to integration of heterogeneous and independent data sources. Emphasis on data models, architectures, logic-based techniques for query processing, metadata and consistency management, the role of XML and ontologies in data integration; connections to schema mapping, data exchange, and P2P systems.

Prerequisites: COMP 3005 or equivalent.

Precludes additional credit for COMP 5900 section 'G' offered fall term 2002 and 2004.

COMP 5307 [0.5 credit] (CSI 5101)

**Knowledge Representation**

KR is concerned with representing knowledge and using it in computers. Emphasis on logic-based languages for KR, and automated reasoning techniques and systems; important applications of this traditional area of AI to ontologies and semantic web.

Prerequisites: COMP 1805 and COMP 3005, or equivalents.

Precludes additional credit for COMP 5900 section 'X' offered in winter term from 2003-2004 to 2005-2006 inclusive.

COMP 5308 [0.5 credit] (CSI 5102)

**Topics in Medical Computing**

Introductory course on data structures, algorithms, techniques, and software development related to medical computing (in particular spatial modeling). Topics may include: computational geometry algorithms for cancer treatment, medical imaging, spatial data compression algorithms, dynamic programming for DNA analysis.

Prerequisite: COMP 3804 or equivalent. Precludes additional credit for COMP 5900 section 'Y' offered 2001-2002 to 2005-2006 inclusive.

COMP 5400 [0.5 credit] (CSI 5310)

**Software Patterns**

Current developments in software patterns, three-part rules expressing relations between software contexts, problems and solutions. Pattern categories discussed include architectural, design, analysis, refactoring, general-purpose, anti-patterns, and idioms. Students are required to apply existing patterns and to develop and defend new ones.

Prerequisites: COMP 3004 or equivalent.

COMP 5401 [0.5 credit] (CSI 5389, CSI 5789)

**Electronic Commerce Technologies**

Introduction to business models and technologies. Search engines. Cryptography. Web services and agents. Secure electronic transactions. Value added e-commerce technologies. Advanced research questions.

Prerequisites: COMP 2005 and COMP 4104, or CSI 4128 and CSI 3140, or equivalent.

COMP 5402 [0.5 credit] (CSI 5142)

**Protocols for Mobile and Wireless Networks**

Link and network layer protocols of wireless networks; applications of wireless networks may be discussed. Topics may include: protocol implementation, mobile IP, resource discovery, wireless LANs/PANs, and Spreadpectrum.

Precludes additional credit for SYSC 5306.

Prerequisite: COMP 3203 or equivalent.

COMP 5404 [0.5 credit] (CSI 5144)

**Computer-Aided Program Verification**

Automatic verification techniques for concurrent, reactive, and real-time programs. Topics may include temporal logics, the basic model-checking algorithm, symbolic model checking, compositional techniques, exploiting abstraction and symmetry, models based on partial orders, model-checking for the mu-calculus, applications to communication protocols, computer security and digital circuits.

Prerequisite: COMP 4004 or equivalent.

COMP 5406 [0.5 credit] (CSI 5105)

**Network Security and Cryptography**

Advanced methodologies selected from symmetric and public key cryptography, network security protocols and infrastructure, identification, secret-sharing, anonymity, intrusion detection, firewalls, defending network attacks and performance in communication networks.

Prerequisites: COMP 3203 and COMP 4109, or equivalent, or permission of the instructor.

COMP 5407 [0.5 credit] (CSI 5116)

**Authentication and Software Security**

Specialized topics in security including advanced authentication techniques, user interface aspects, electronic and digital signatures, security infrastructures and protocols, software vulnerabilities affecting security, untrusted software and hosts, protecting software and digital content.

Prerequisites: COMP 3000 and COMP 4108, or equivalent; or permission of the instructor.

COMP 5408 [0.5 credit] (CSI 5121)

**Advanced Data Structures**

Simple methods of data structure design and analysis that lead to efficient data structures for several problems. Topics include randomized binary search trees, persistence, fractional cascading, self-adjusting data structures, van Emde Boas trees, tries, randomized heaps, and lowest common ancestor queries.

Prerequisite: COMP 4804 or equivalent.

## Graduate Courses - Computer Science (COMP)

COMP 5409 [0.5 credit] (CSI 5127)

**Applied Computational Geometry**

Computer-based representation and manipulation of geometric objects. Design and analysis of efficient algorithms for solving geometric problems in applied fields such as Computer-Aided Design and Manufacturing, Cartography, Materials Science, and Geometric Network Design.

Prerequisite: COMP 4804 or equivalent.

COMP 5703 [0.5 credit] (CSI 5163)

**Algorithm Analysis and Design**

Topics of current interest in the analysis and design of sequential and parallel algorithms for non-numerical, algebraic and graph computations. Lower bounds on efficiency of algorithms. Complexity classes.

Prerequisite: permission of the School.

COMP 5704 [0.5 credit] (CSI 5131)

**Parallel Algorithms and Applications in Bioinformatics**

Multiprocessor architectures from an application programmer's perspective: programming models, processor clusters and multi-core processors, algorithmic paradigms, efficient parallel problem solving, limits of parallelism, software scalability and portability. Projects with an emphasis on high performance computing in bioinformatics. Programming experience on parallel processing equipment.

Prerequisite: COMP 3804 or the equivalent.

COMP 5802 [0.5 credit]

**Introduction to Information and Systems Science**

An introduction to the process of applying computers in problem solving. Emphasis is placed on the design and analysis of efficient computer algorithms for large, complex problems. Applications in a number of areas are presented: data manipulation, databases, computer networks, queuing systems, optimization. (Also listed as MATH 5802, SYSC 5802, ISYS 5802.)

COMP 5807 [0.5 credit] (CSI 5104)

**Formal Language and Syntax Analysis**

Computability, unsolvable and NP-hard problems. Formal languages, classes of languages, automata. Principles of compiler design, syntax analysis, parsing (top-down, bottom-up), ambiguity, operator precedence, automatic construction of efficient parsers, LR, LR (O), LR(k), SLR, LL(k); syntax directed translation. (Also listed as MATH 5807.)

Prerequisite: COMP 3002, or MATH 4805 or MATH 5605, or the equivalent.

COMP 5900 [0.5 credit] (CSI 5140)

**Selected Topics in Computer Science**

Selected topics, not covered by other graduate courses. Details will be available from the School at the time of registration.

COMP 5901 [0.5 credit] (CSI 5901)

**Directed Studies (M.C.S.)**

A course of independent study under the supervision of a member of the School of Computer Science.

COMP 5902 [0.5 credit] (CSI 5900)

**Graduate Project (M.C.S./M.Sc. [ISS])**

COMP 5903 [1.0 credit] (CSI 6900)

**Intensive Graduate Project (M.C.S.)**

A one- or two-session course. For M.C.S. non-thesis option students only. Not to be combined for credit with COMP 5902.

COMP 5904 [0.0 credit] (CSI 5902)

**Master's Seminar**

To complete this course, the student must attend 5 graduate seminars at Carleton, and 5 at SITE within a year. The student must also make one presentation in the context of this graduate seminar.

COMP 5905 [2.5 credits] (CSI 7999)

**M.C.S. Thesis**

COMP 5906 (CSI 6001) [0.0 credit]

**Master's Co-operative Workterm 1**

Prerequisites: registration in the Co-operative Education option of the Master of Computer Science program and permission of the School.

COMP 5907 (CSI 6002) [0.0 credit]

**Master's Co-operative Workterm 2**

Prerequisites: registration in the Co-operative Education option of the Master of Computer Science program and permission of the School.

COMP 5908 [1.5 credits]

**M.Sc. Thesis in Information and Systems Science**

(Also listed as MATH 5908, SYSC 5908).

COMP 6100 [0.5 credit] (CSI 7131)

**Advanced Parallel and Systolic Algorithms**

Continuation of COMP 5704.

Prerequisite: COMP 5704.

COMP 6104 [0.5 credit] (CSI 7314)

**Advanced Topics in Object-Oriented Systems**

Advanced object-oriented software engineering, in particular the issues of reuse and testing. Sample topics include: interaction modeling; class and cluster testing; traceability; design patterns and testing; the C++ standard template library. Students will carry out research.

Prerequisite: COMP 5104 or permission of instructor.

COMP 6601 [0.5 credit] (CSI 7160)

**Advanced Topics in the Theory of Computing**

COMP 6602 [0.5 credit] (CSI 7170, CSI 7970)

**Advanced Topics in Distributed Computing**

COMP 6603 [0.5 credit] (CSI 7161, CSI 7561)

**Advanced Topics in Programming Systems and Languages**

COMP 6604 [0.5 credit] (CSI 7162)

**Advanced Topics in Computer Applications**

COMP 6605 [0.5 credit] (CSI 7163)

**Advanced Topics in Computer Systems**

COMP 6901 [0.5 credit] (CSI 7901)

**Directed Studies (Ph.D.)**

COMP 6902 [0.5 credit] (CSI 7900)

**Graduate Project (Ph.D.)**

COMP 6907 [0.0 credit] (CSI 9998)

**Doctoral Comprehensive**

A committee must be assembled and approve at least 3 topics for written examination: typically, a major and two minor areas. An oral examination occurs if the written exam is passed. Both elements must take place within the first 4 terms following initial registration in the program.

The comprehensive may be failed, passed conditionally (i.e., with extra course requirements) or passed unconditionally. If failed this course may be retaken at most one time.

COMP 6908 [0.0 credit] (CSI 9997)

**Doctoral Proposal**

Within 8 terms following initial registration in the program, a document generally defining the problem addressed, relating it to the literature, and outlining the hypotheses, goals, research methodology, initial results and validation approach must be submitted to an examination committee and successfully defended.

COMP 6909 [8.5 credits] (CSI 9999)

**Ph.D. Thesis**

## Cultural Mediations (CLMD)

### Institute of Comparative Studies in Literature, Art and Culture

CLMD 6101 [1.0 credit]

#### Perspectives on Interdisciplinarity in Cultural Theory

Theory and practice of interdisciplinary studies of culture. Attention will be paid to those issues in cultural theory of the twentieth century that inform interdisciplinary work today in literature, film, music, art and new media.

CLMD 6102 [0.5 credit]

#### Issues in Transnationalism

This course will consider cultural production in the context of global exchange, examining the processes of mediation -- conflict, collaboration, transformation and hybridization -- that govern the movement of populations, objects, and ideas as they travel across borders and between societies.

CLMD 6103 [0.5 credit]

#### Issues of Cultural Mediation and Representation

This course will examine how works from different cultures or works in the same or different media from the same culture pose questions about the nature of representation, interpretation, meaning and affect. Emphasis will be upon the relation between social intelligibility and textual features.

CLMD 6104 [0.5 credit]

#### Issues of Subjectivity and Difference

The theory of the subject and its relations, with examples from specific cultural practices in literary studies, film, music, art, popular culture and new media.

CLMD 6105 [0.5 credit]

#### Issues in the Technologies of Culture

The role that technology plays in changing models of literacy, visibility and aurality. The technologies of the cultures of print, vision and sound will be discussed through specific examples of cultural practices in various media.

CLMD 6106 [0.5 credit]

#### Issues in History and Culture

History as an object of representation and a condition of human experience. Historical approaches to print, visual, and auditory culture in relation to theoretical texts and specific periods and genres. Topics may include history and the novel, visual culture in history, and historiography.

CLMD 6900 [0.5 credit]

#### Interdisciplinary Research Methods

Students will be introduced to a range of methods of inquiry, procedures and practices across related disciplines, using both traditional and electronic research tools, as preparation for the doctoral dissertation, practices of academic publishing, conference presentations, and private and public sector writing and research protocols.

CLMD 6901 [0.5 credit]

#### Directed Readings in Cultural Mediations

This tutorial is designed to permit students to pursue research on topics chosen in consultation with members of faculty and the graduate supervisor.

CLMD 6902 [0.5 credit]

#### Special Topic in Cultural Mediations

This in-class course offers selected topics in interdisciplinary studies of culture not available in the regular course offerings.

CLMD 6903 [0.5 credit]

#### Special Topic in Cultural Mediations

This in-class course offers selected topics in interdisciplinary studies of culture not available in the regular course offerings.

CLMD 6904 [0.5 credit]

#### Special Topic in Cultural Mediations

This in-class course offers selected topics in interdisciplinary studies of culture not available in the regular course offerings.

CLMD 6907 [1.0 credit]

#### Comprehensive I

A general examination of the broad range of cultural theory of the twentieth century as it informs interdisciplinary work today and the historical, intellectual and cultural frames of reference that this work invokes.

CLMD 6908 [1.0 credit]

#### Comprehensive II

A discipline-specific examination in a specialized area of study chosen by the student in consultation with the graduate supervisor. Students will choose from one of the following comprehensive areas: Literary Studies; Visual Culture; Musical Culture; New Technologies.

CLMD 6909

#### Ph.D. Thesis



## Earth Sciences (ERTH)

### Department of Earth Sciences

ERTH 5001 [0.5 credit] (GEO 5301)

#### Seminars in Earth Sciences I

One-term modular courses covering a spectrum of Earth Science topics and current research problems, ranging from the geology and geophysics of the solid Earth, to its surface environment and crustal resources. A minimum of four modules offered per term, three must be completed to obtain course credit. Students may not take a module for credit that is offered by their supervisor, but may do so with the permission of the OCGC Director. Choice of modules must be approved by the OCGC Director. Course complements EARTH 5002.

ERTH 5002 [0.5 credit] (GEO 5302)

#### Seminars in Earth Sciences II

One-term modular courses covering a spectrum of Earth Science topics and current research problems, ranging from the geology and geophysics of the solid Earth, to its surface environment and crustal resources. A minimum of four modules offered per term, three must be completed to obtain course credit. Students may not take a module for credit that is offered by their supervisor, but may do so with the permission of the OCGC Director. Choice of modules must be approved by the OCGC Director. Course complements EARTH 5001.

ERTH 5104 [0.5 credit] (GEO 5114)

#### Mineralogy

An advanced course covering selected topics in mineralogy, such as crystallography, crystal chemistry, crystal structure, mineralogy of rock-forming mineral groups, and instrumental methods in mineralogical research, such as use of electronic optical instruments, spectroscopy, and X-ray crystallography; seminar presentations and practical exercises.

ERTH 5105 [0.5 credit]

#### Thermodynamics, Kinetic Theory, and Metamorphic Petrology

Phase equilibria, phase diagrams, and the kinetics of mineral reactions; mass transfer; regional and global aspects of metamorphic petrogenesis

ERTH 5202 [0.5 credit] (GEO 5122)

#### Advanced Igneous Petrology

Integrates physical and chemical processes with the dynamics of magmatic systems to understand igneous processes.

ERTH 5204 [0.5 credit] (GEO 5124)

#### Geology and Geochemistry of Ore Deposits

Advanced aspects of geology, geochemistry, genesis, and exploration of ore deposits. Laboratory and field examination of different ore deposit types and their host rocks.

ERTH 5301 [0.5 credit] (GEO 5131)

#### Siliciclastic Sedimentology

Origin and significance of physical sedimentary processes and structures. Analysis of ancient siliciclastic depositional environments in a facies model and sequence stratigraphic framework. Course involves lectures, seminars and field excursions.

ERTH 5305 [0.5 credit] (GEO 5135)

#### Carbonate Sedimentology

Aspects of modern depositional systems, dynamic facies models, sequence stratigraphy, mineralogy, and diagenesis of carbonate sediments. The practical part of the course will consist of a field-laboratory project that integrates various techniques in carbonate sedimentology (mapping, petrography, staining, cathodoluminescence, fluorescence, SEM).

ERTH 5306 [0.5 credit] (GEO 5136)

#### Paleobiology

Extinctions, micro- and macro-evolutionary processes, long-term trends and cycles in the Phanerozoic; functional morphology; application of invertebrates to biostratigraphy, paleoceanography and paleolimnology.

ERTH 5309 [0.5 credit] (GEO 5139)

#### Glacial and Periglacial Geology

An examination of various sedimentary environments associated with glacial and periglacial processes and their significance for mineral exploration and environmental geochemistry. Study of cold climate non-glacial conditions and the development of permafrost and permafrost-related features, including the effect of groundwater flow on permafrost distribution.

ERTH 5402 [0.5 credit] (GEO 5142)

#### Environmental Geoscience

A study-seminar course in which students will examine, in depth, certain environmental problems, including geological hazards, mineral and energy consumption and environmental degradation. The relation between development and the environment will be considered.

ERTH 5403 [0.5 credit] (GEO 5143)

#### Environmental Isotopes and Groundwater Geochemistry

Stable environmental isotopes ( $^{18}\text{O}$ ,  $^2\text{H}$ ,  $^{13}\text{C}$ ,  $^{34}\text{S}$ ,  $^{15}\text{N}$ ) in studies of groundwater origin and flow, and geothermal studies. Groundwater dating techniques involving tritium and radio-carbon, and exotic radioisotopes (e.g.,  $^{36}\text{Cl}$ ,  $^{39}\text{Ar}$ ,  $^{85}\text{Kr}$ ). Low temperature aqueous geochemistry and mineral solubility with emphasis on the carbonate system. Some applications to paleoclimatology will be discussed.

ERTH 5406 [0.5 credit] (GEO 5146)

#### Techniques of Groundwater Resources Evaluation

Governing groundwater flow equations, initial and boundary conditions; simple numerical solutions (spreadsheets); complex numerical solutions (commercial software); and analytical solutions. Applications: aquifer response test analysis, capture zone analysis, groundwater flow modeling, water budgeting, and aquifer vulnerability assessment.

ERTH 5407 [0.5 credit] (GEO 5147)

#### Geochemistry of Natural Waters

Aqueous speciation, solubility of metals, minerals and gas, reaction kinetics and equilibria. Chemistry and dynamics of groundwaters and hydrothermal fluids.

ERTH 5408 [0.5 credit] (GEO 5148)

#### Theory of Flow and Contaminant Transport in Geological Materials

Development of governing groundwater flow equations and solute transport equations from first principles, and application of principles in case studies. Topics may include forces and potentials, fluids, geological materials, contaminants, case studies. Prerequisite: undergraduate hydrogeology or instructor's permission.

ERTH 5501 [0.5 credit] (GEO 5151)

#### Precambrian Geology

Geology and tectonic history of the Canadian Shield, emphasizing modern four-dimensional interpretations (2D mapping, depth, time); comparison and correlation with other Precambrian shields; global Precambrian tectonic evolution through review of continental reconstructions; Precambrian mineral deposits; field trips and research projects.



ERTH 5503 [0.5 credit] (GEO 5153)

**Computer Techniques in the Earth Sciences**

A practical course in the application of computer techniques in the acquisition and interpretation of geoscientific data. Topics may include: remote sensing and geographic information systems; geostatistical analysis techniques; analysis and modeling of geoscientific data.

Prerequisites: permission of the Department.

ERTH 5507 [0.5 credit] (GEO 5157)

**Tectonic Processes Emphasizing Geochronology and Metamorphism**

Applications of empirical, analytical and quantitative techniques to problems in regional geology and crustal tectonics; orogenic processes; heat and metamorphism; isotopic geochronology as applied to thermal history.

ERTH 5600 [0.5 credit] (GEO 5160)

**Chemistry of the Earth**

An examination of the composition of the mantle and crust in selected tectonic settings, such as subduction zones and hot spots. Topics may include how geochemical data constrain geodynamic settings of study areas.

ERTH 5603 [0.5 credit] (GEO 5163)

**Stable Isotope Geochemistry**

Mechanisms of isotope fractionation in nature; physical and chemical isotope fractionation, kinetic isotope effects. Variation of stable isotope ratios (hydrogen, carbon, oxygen and sulphur) in nature. Preparation techniques of natural samples for isotope analysis. Applications of stable isotopes to study magma genesis, ore genesis, nature of water and formation fluids and sedimentary environments.

ERTH 5609 [0.5 credit] (GEO 5169)

**Radiogenic Isotope Geochemistry**

Nucleosynthesis; chemical differentiation of the Earth. Evolution of large-scale isotopic reservoirs. Isotopic tracers ( $^{143}\text{Nd}/^{144}\text{Nd}$ ,  $^{87}\text{Sr}/^{86}\text{Sr}$ , common Pb). Geochronology; fundamentals and application of Sm/Nd, Rb/Sr, U/Pb, K/Ar and Lu/Hf methods. Evolution of the solid Earth from the isotopic perspective.

ERTH 5701 [0.5 credit] (GEO 5171)

**Physics of the Earth**

The physics and dynamics of the solid Earth: seismology; gravitational and magnetic fields, thermal state. Geophysical constraints on the structure and composition of the interior. Geodynamic processes.

ERTH 5703 [0.5 credit] (GEO 5173)

**Structural Geology**

Deformation processes and the analysis of geological structures at all scales.

ERTH 5704 [0.5 credit] (GEO 5174)

**Tectonics**

Dynamic and geological aspects of plate tectonics throughout Earth history.

ERTH 5707 [0.5 credit] (GEO 5177)

**Engineering Seismology**

Seismological topics with engineering applications. Characterization of seismicity and seismic sources (areas and faults). Seismic hazard analysis. Empirical and theoretical modeling of strong ground motion in time and frequency domain.

ERTH 5708 [0.5 credit] (GEO 5178)

**Earthquake Signal Processing**

Theoretical and practical aspects of earthquake signal processing, seismic instrumentation, instrument response and application of spectral analysis and response spectra.

ERTH 5903 [0.5 credit] (GEO 5193)

**Field Studies**

Systematic investigations of geological problems, based on a minimum of fifteen days field work plus related library research and laboratory projects. Written report required.

ERTH 5906 [0.0 credit]

**M.Sc. Geoscience Seminar**

Participation in the Geoscience Seminar Series.

ERTH 5907 [0.0 credit]

**Ph.D. Geoscience Seminar**

Participation in the Geoscience Seminar Series.

ERTH 5909 (GEO 7999)

**M.Sc. Thesis**

A thesis proposal must be approved by the research advisory committee by the end of the first year of registration.

ERTH 6908 [0.0 credit] (GEO 9998)

**Ph.D. Comprehensive Examination**

The Comprehensive Examination involves a thesis proposal and oral examination in three different areas of specialization. Students will receive a grade of Satisfactory, Unsatisfactory or Pass with Distinction. This exam is taken within the first twelve months of registration in the program.

ERTH 6909 (GEO 9999)

**Ph.D. Thesis**

A thesis proposal must be approved by the research advisory committee by the end of the first year of registration.

## Economics (ECON)

### Department of Economics

ECON 5000 [0.5 credit]

#### Microeconomic Theory

Theories of the behaviour of individual economic agents: consumers and producers and their relation to the theories of price determination.

Precludes additional credit for ECON 5001.

ECON 5002 [0.5 credit]

#### Macroeconomic Theory

Macroeconomic theory and its implications for economic policy are surveyed in this course, comparing alternative approaches for a variety of topics.

ECON 5005 [0.5 credit]

#### Econometrics I

An introduction to econometrics at the graduate level. Topics include the analysis and treatment of univariate and multivariate regression models, GLS, IV, and maximum likelihood estimation, hypothesis testing, seemingly unrelated regression models, and simultaneous equations models, together with relevant economic applications.

ECON 5006 [0.5 credit]

#### Methods of Economic Research

Formulation, specification and analysis of economic and econometric models; derivation of policy implications; communication of results and economic methodology.

Prerequisites: ECON 5000 (ECON 5001 if taken before 2007-2008) and ECON 5005, or permission of the Department.

ECON 5010 [0.5 credit] (ECO 7125, ECO 7525)

#### Mathematical Economics

General equilibrium; dynamic optimization; game theory.

Precludes additional credit for ECON 5205.

ECON 5051 [0.5 credit]

#### Asset Pricing

Value, the dynamic optimization problems of firms and investors, risk-neutral pricing, and related topics.

ECON 5052 [0.5 credit]

#### Financial Markets and Instruments

Capital structure, debt financing, options, financial planning, corporate governance, and related topics.

ECON 5055 [0.5 credit]

#### Financial Econometrics

The econometrics of empirical finance including parametric and nonparametric models of volatility, evaluation of asset-pricing theories, and models for risk management and transactions data.

Prerequisite: ECON 5005 (or equivalent).

ECON 5058 [0.5 credit]

#### Advanced Topics in Financial Economics

Current research in financial economics. Topics may include theoretical analysis, quantitative methods, policy issues, and applications to the financial industry.

Prerequisite: ECON 5051 or ECON 5052, which may be taken concurrently with ECON 5058.

ECON 5209 [0.5 credit] (ECO 6106, ECO 6506)

#### Selected Topics in the History of Economic Thought

The development of economic thought through time in relation to selected economic problems. Also offered at the undergraduate level, with different requirements, as ECON 4209, for which additional credit is precluded.

Precludes additional credit for ECON 5201 and ECON 5202.

ECON 5230 [0.5 credit]

#### Economic History

The application of economic theory and quantitative techniques to selected topics in economic history, which may include historical patterns of growth and welfare, nineteenth-century globalization, technological change, the development of agriculture, industrialization, the Great Depression, and the origins of central banks.

ECON 5301 [0.5 credit] (ECO 6140, ECO 6540)

#### Firms and Markets

Theories pertaining to industrial organization and their application to industries in Canada and elsewhere by way of empirical studies.

ECON 5302 [0.5 credit] (ECO 6141, ECO 6541)

#### Competition Policy

An examination of the rationale and application of competition policy with particular attention to the Canadian economy.

ECON 5303 [0.5 credit] (ECO 6142, ECO 6542)

#### Regulation and Public Enterprise

An examination of regulation and public enterprise as alternative approaches for influencing industry conduct and performance.

ECON 5309 [0.5 credit]

#### Applied Industrial Economics

The application of industrial economics, with special emphasis on Canada and the rest of North America. Topics include the structure of consumer demand, firm production and investment, industrial structure and international trade, and the effect of government policies on industrial development.

ECON 5361 [0.5 credit] (ECO 6191, ECO 6591)

#### Labour Economics I

The application of microeconomic and macroeconomic theory to the labour market. Topics include labour supply and labour demand, wage determination, human capital, and the economics of education, and unemployment.

Precludes additional credit for ECON 5360 and ECON 5307.

ECON 5362 [0.5 credit] (ECO 6192, ECO 6592)

#### Labour Economics II

Personnel economics and contract theory. Topics include the economics of unions, discrimination, the economics of the household, gender and fertility, and labour mobility.

ECON 5363 [0.5 credit] (ECO 6193, ECO 6593)

#### Advanced Topics in Labour Economics

Topics may include program evaluation, inequality, labour markets and health, labour markets and crime, and the structural estimation of labour market models.

Precludes additional credit for ECON 5360 and ECON 5307.

ECON 5401 [0.5 credit] (ECO 6130, ECO 6530)

#### Public Economics: Expenditures

A discussion of the role of government expenditures, both in theory and with reference to the Canadian economy.

ECON 5402 [0.5 credit] (ECO 6131, ECO 6531)

#### Public Economics: Taxation

Analysis of the effects of various forms of taxation on economic performance.

ECON 5403 [0.5 credit] (ECO 6133, ECO 6533)

#### Public Choice

The integration of economics and politics to provide a broader understanding of the evolution of the public sector. The consequences of political institutions for the allocation and distribution of

resources. Applications to a variety of Canadian and international policy issues.

ECON 5404 [0.5 credit] (ECO 6132, ECO 6532)

**Fiscal Federalism**

Economic aspects of federalism, including efficiency, redistribution, consideration of a federal system of government, intergovernmental grants, and problems of stabilization policy in a federal context.

ECON 5407 [0.5 credit]

**Cost-Benefit Analysis and Project Evaluation**

Techniques and problems in cost-benefit analysis and the evaluation of public and private projects. Topics may include surplus measurement, investment decision rules, shadow pricing, the valuation of non-marketed goods, distributive weights, and the evaluation of projects involving uncertainty, loss of life, and/or population change.

ECON 5500 [0.5 credit] (ECO 6170, ECO 6570)

**Theory of Economic Development**

Theoretical approaches of the economic development literature in relation to the historical, economic, environmental, social, and political dimensions of the development process.

ECON 5504 [0.5 credit] (ECO 6171, ECO 6571)

**Economic Development: Internal Aspects**

Major domestic problems of economic development. Topics may include employment, income distribution, choice of technology, sectoral allocation of resources, human resource development, and domestic environmental issues.

ECON 5505 [0.5 credit] (ECO 6172, ECO 6572)

**Economic Development: International Aspects**

Key problems of international economic development such as trade in primary commodities and manufactures, financial flows and debt, the role of multinational corporations, the transfer of technology, and the international dimensions of environmental issues as they relate to developing countries.

ECON 5507 [0.5 credit] (ECO 6173, ECO 6573)

**Environmental Aspects of Economic Development**

Policy aspects of sustainable economic development and environmental quality in developing countries. Topics may include energy use, deforestation, drought and desertification, depletion of natural resources, debt, environment and poverty, sustainable industrial and agricultural development, conservation policies, pollution control, and global environmental issues.

ECON 5601 [0.5 credit] (ECO 6160, ECO 6560)

**International Trade: Theory and Policy**

International trade theory and its implications for economic policy, with emphasis on topics such as determinants of trade and specialization, gains from trade and commercial policy, international factor mobility, growth, and development.

ECON 5602 [0.5 credit] (ECO 6161, ECO 6561)

**International Monetary Theory and Policy**

Key aspects of international monetary theory and policy, with emphasis on topics such as sources of equilibrium and disequilibrium in the balance of payments, balance-of-payments adjustment under fixed versus flexible exchange rates, international capital movements, and recent issues in the international monetary system.

ECON 5603 [0.5 credit] (ECO 6162, ECO 6562)

**Topics in International Economics**

Key topics in international economics, including theoretical analysis, quantitative methods and policy formulation, implementation, and evaluation. Prerequisite: ECON 5601 or ECON 5602, which may be taken concurrently with ECON 5603.

ECON 5606 [0.5 credit] (ECO 6180, ECO 6580)

**Microeconomic Aspects of Monetary Theory**

Microeconomic foundations of monetary theory. Alternative theories for the existence of money. Commodity, private and fiat money systems. The integration of monetary theory with the theory of value.

ECON 5607 [0.5 credit] (ECO 6181, ECO 6581)

**Macroeconomic Aspects of Monetary Theory**

Monetary theory and the macroeconomic interactions of money. Topics may include: inflation, money and wealth; the optimum quantity of money; the welfare aspects of monetary economies; the supply of money and its composition; stabilization policy; money, capital, and growth.

ECON 5608 [0.5 credit] (ECO 6182, ECO 6582)

**Aspects of Financial Intermediation**

The evolution of the financial system with emphasis on the theory of financial institutions and its interrelationship with the money supply process and the central bank. Contemporary monetary and finance theory applied to institutional problems in both historical and contemporary settings.

ECON 5609 [0.5 credit] (ECO 6183, ECO 6583)

**Explorations in Monetary Economics**

Explorations in theory, policy recommendations, and empirical study. Course material challenges traditional approaches by examining such topics as the endogeneity of money, the role of credit, the finance motive, the circuit approach, flow-of-funds analysis, and austerity policies.

ECON 5700 [0.5 credit]

**Social and Economic Measurement**

Index number theory and national accounting. Topics may include: biases in indexes, inflation accounting, the theory of international comparisons, and the measurement of business and personal income, capital and depreciation, and productivity.

ECON 5712 [0.5 credit] (ECO 6175, ECO 6575)

**Micro-Econometrics**

Analysis of the concepts and tools used in micro-econometrics with particular focus on empirical applicability. Topics may include discrete choice models, limited dependent variables, panel data, duration models, and program evaluation, together with relevant economic applications.

Precludes additional credit for ECON 5702.

Prerequisite: ECON 5005 (or equivalent).

ECON 5713 [0.5 credit] (ECO 6176, ECO 6576)

**Time-Series Econometrics**

Analysis of the concepts and tools used in time-series econometrics with particular focus on empirical applicability. Topics may include cointegration analysis, error-correction models, VAR models, volatility analysis, and non-linear time-series models, together with relevant economic applications.

Precludes additional credit for ECON 5703.

Prerequisite: ECON 5005 (or equivalent).

ECON 5801 [0.5 credit]

**Regional Economics**

Regional economic disparities in Canada, theories and public policy relating thereto. Consideration will be given to the concept of regions, location of industry and industrial structure, and to growth determinants.

ECON 5802 [0.5 credit]

**Urban Economics**

The economic properties of urban areas. Attention will be focused on the macrodynamics of urban development, together with the microstatics of the equilibrium properties of the urban land market.



ECON 5803 [0.5 credit] (ECO 6143, ECO 6543)

**Economics of Natural Resources**

Dynamic optimization; theory of renewable and non-renewable natural resources, including the environment; policy options for correcting market failures.

Precludes additional credit for ECON 5305.

ECON 5804 [0.5 credit] (ECO 6151, ECO 6551)

**Economics of the Environment**

The environment as natural capital; environmental valuation techniques; elements of environmental income accounting; sustainable development theories and practice; institutional questions and policy issues.

Precludes additional credit for ECON 5306.

Prerequisite: ECON 5803.

ECON 5821 [0.5 credit]

**Canadian Economy I**

Aspects and problems of the Canadian economy. Topics may include the economic development of Canada, regional development, industrial organization, factor markets, income distribution, international trade and capital flows, and macroeconomic stability.

Precludes additional credit for ECON 5101.

ECON 5822 [0.5 credit]

**Canadian Economy II**

Economic theory applied to the workings of the Canadian economy. Empirical estimation of various aspects of factor market operation, production, distribution, and aggregate economy.

Precludes additional credit for ECON 5102.

ECON 5840 [0.5 credit]

**Law and Economics**

The interrelationships between law and economics, emphasizing transaction costs and property rights. Economic analysis of such topics as the allocative effects of alternative property rights, contract, tort, and nuisance law, and the economics of crime, pollution, pay television, and eminent domain.

Precludes additional credit for ECON 5308.

ECON 5880 [0.5 credit]

**Special Topics**

Topics may vary from year to year and are announced in advance of the registration period.

Prerequisite: permission of the Department.

ECON 5902 [0.5 credit]

**Internship Placement**

Internship students are required to register in this course during their work term.

Prerequisite: permission of the Department.

ECON 5904 [0.5 credit]

**Directed Readings**

This course is designed to permit students to pursue research on topics chosen in consultation with faculty members and the M.A. Supervisor.

Prerequisite: permission of the Department.

ECON 5906 [0.5 credit]

**Directed Research**

At least one paper will be required of a student enrolled in this course.

Prerequisite: permission of the Department.

ECON 5909 [1.5 credit]

**M.A. Thesis**

ECON 6000 [0.5 credit] (ECO 7922)

**Economic Theory: Microeconomics**

Critical aspects of microeconomic theory drawn from recent analysis of consumer behaviour, costs and production, transaction costs, uncertainty, and the organization of economic activity.

Prerequisite: ECON 5000 (or equivalent).

ECON 6002 [0.5 credit] (ECO 7923)

**Economic Theory: Macroeconomics**

Critical aspects of macroeconomic theory drawn from recent analysis of the microeconomic foundations of macroeconomics, concepts of macroeconomic equilibrium, and the impact of monetary and fiscal disturbances. Attention is also directed to a variety of topics related to the conduct of macroeconomic policy.

Precludes additional credit for ECON 6001.

Prerequisite: ECON 5002 (or equivalent).

ECON 6005 [0.5 credit] (ECO 7126, ECO 7526)

**Econometrics II**

Statistical foundations of econometrics: estimation, inference, and decision theory. Topics may include likelihood and moment-based inference, asymptotic theory, semi-parametric and non-parametric models, Bayesian approaches, and structural models, together with relevant economic applications.

Precludes additional credit for ECON 5701.

Prerequisite: ECON 5005 (or equivalent).

ECON 6714 [0.5 credit] (ECO 7177, ECO 7577)

**Advanced Topics in Econometrics**

Coverage of one or more areas of current econometric research.

Prerequisite: ECON 6005.

ECON 6900 [0.5 credit] (ECO 7990)

**Comprehensive Examination in Microeconomic Theory**

ECON 6902 [0.5 credit] (ECO 7991)

**Comprehensive Examination in Macroeconomic Theory**

ECON 6903 [0.0 credit]

**Seminar Attendance**

ECON 6904 [0.5 credit] (ECO 7980)

**Directed Readings**

This course is designed to permit students to pursue research on topics chosen in consultation with faculty members and the Ph.D. Supervisor.

Prerequisite: permission of the Department.

ECON 6905 [0.5 credit] (ECO 9990)

**Comprehensive Examination in Primary Field**

ECON 6907 [0.5 credit] (ECO 7002)

**Thesis Workshop I**

ECON 6908 [0.5 credit] (ECO 7004)

**Thesis Workshop II**

ECON 6909 [5.0 credits] (ECO 9999)

**Ph.D. Thesis**



## Electronics (ELEC)

### Department of Electronics

ELEC 5200 [0.5 credit] (ELG 6320)

**Advanced Topics in Integrated Circuits and Devices**  
Topics vary from year to year.

ELEC 5401 [0.5 credit] (ELG 6341)

**Signal Integrity in High-Speed Designs: Modeling and Analysis**

Crosstalk, distortion, ground bounce, skin effect. Interconnect modeling/simulation, packages, ground/power planes, Elmore delay, lossy-coupled, frequency-dependent transmission lines, telegraphers equations, extraction, measured parameters, macromodeling: passivity/causality, MoC/MRA, vector fit, model reduction, electromagnetic compatibility/interference, mixed-domain systems, concurrent analysis. Precludes additional credit for this course previously offered as a Special Topics course ELEC 5704 (ELG 6374).

Prerequisite: permission of the Department.

ELEC 5402 [0.5 credit] (ELG 6342)

**Computer Methodologies for Digital and RF Design**

Digital design process: behavioral models, HDL languages, synthesis, design hierarchy. Simulation of digital circuits. Analog/RF Circuits: large-signal models, timing analysis and relaxation techniques. Iterative methods for solution of nonlinear differential equations. Power supply analysis, ground analysis. Simulation of mixer circuits, multi-tone circuits. Thermal analysis, self-heating.

Precludes additional credit for this course previously offered as a special topics course ELEC 5704Y (ELG 6374Y).

Prerequisite: permission of the instructor.

ELEC 5404 [0.5 credit] (ELG 6344)

**Neural Networks for High-Speed/High-Frequency Circuit Design**

Introduction to neural network methodologies for computer-aided design of high-speed/high-frequency circuits, including modeling of passive and active devices/circuits, and their applications in high-level design and optimization in wired and wireless electronic systems.

ELEC 5405 [0.5 credit] (ELG 6340)

**Advanced Linear and Nonlinear Circuit Theory and Applications**

Graph theory, incidence matrices, cutset matrices, generalized KCL, topological formulation, state-space equations, Tellegen's theorem, state-transition matrix, multi-port representation, stability, passivity, causality, synthesis of passive circuits, active networks, nonlinear dynamic circuits.

ELEC 5409 [0.5 credit] (ELG 6349)

**Microwave and Millimeterwave Integrated Circuits**

Design of communications electronics components with emphasis on GaAs MMIC implementation. Overview of MESFET, HEMT, HBT device modeling. Integrated lumped/ distributed passive element modeling. Broadband impedance matching. Design of direct-coupled amplifiers, distributed amplifiers, power devices and amplifiers, phase shifters, switches, attenuators, mixers, oscillators.

ELEC 5501 [0.5 credit] (ELG 6351)

**Passive Microwave Circuits**

Characteristics of homogeneous and inhomogeneous transmission lines and waveguides. Planar transmission lines: stripline, microstrip, coplanar line, slotline. Coupled transmission lines. Modeling of discontinuities. Ferrite components. Microwave network analysis: s-parameters, CAD models. Design of impedance-matching networks, directional couplers, power splitters, filters. Applications in MICs and MMICs.

ELEC 5502 [0.5 credit] (ELG 6352)

**Analog Integrated Filters**

The fundamentals and details of analog continuous-time and SAW filters. Comparison to switched-capacitor filters. Review of filter concepts, types of filters, approximations, transformations. Building blocks such as op amps, transconductance amplifiers, and gyrators. Design using cascaded second-order sections, multiple loop feedback and LC ladder simulations.

ELEC 5503 [0.5 credit] (ELG 6353)

**Radio Frequency Integrated Circuit Design**

Integrated radio front-end component design. Overview of radio systems, frequency response, gain, noise, linearity, intermodulation, image rejection, impedance matching, stability, and power dissipation. Detailed design of low-noise amplifiers, mixers, oscillators and power amplifiers. Use of on-chip inductors and baluns. Process variations, parasitics, and packaging.

ELEC 5504 [0.5 credit] (ELG 6354)

**Analysis of High-Speed Electronic Packages and Interconnects**

Introduction to modeling, simulation and optimization of high-speed VLSI packages; models for packages, interconnects and ground/power planes; lumped, distributed and EM models for interconnects; delay, crosstalk and switching noise; moment matching techniques; concurrent thermal/electrical analysis of IC packages and boards.

ELEC 5506 [0.5 credit] (ELG 6356)

**Simulation and Optimization of Electronic Circuits**

Introduction to computer simulation and optimization of electrical circuits. Time- and frequency-domain formulations for sensitivity analysis and optimization. Optimization techniques for performance-, cost- and yield-driven design of electronic circuits. Optimization approaches to modeling and parameter extraction of active and passive elements.

ELEC 5508 [0.5 credit] (ELG 6358)

**Computer Methods for Analysis and Design of VLSI Circuits**

Formulation of circuit equations. Sparse matrix techniques. Frequency and time-domain solutions. Relaxation techniques and timing analysis. Noise and distortion analysis. Transmission line effects. Interconnect analysis and crosstalk simulation. Numerical inversion techniques. Asymptotic waveform estimation. Mixed frequency/time domain techniques. Sensitivity analysis.

ELEC 5509 [0.5 credit] (ELG 6359)

**Integrated Circuit Technology**

Survey of technology used in silicon VLSI integrated circuit fabrication. Crystal growth and crystal defects, oxidation, diffusion, ion implantation and annealing, gettering, CVD, etching, materials for metallization and contacting, and photolithography. Structures and fabrication techniques required for submicron MOSFETs. Applications in advanced CMOS processes.

ELEC 5600 [0.5 credit] (ELG 6360)

#### **Digital Integrated Circuit Testing**

Production testing of digital integrated circuits. Outline of methods of testing used in production. Testing schemes and design for testability. Faults and fault models, yield estimates, testability measures, fault simulation, test generation methods, sequential testing, scan design, boundary scan, built-in self test, CMOS testing.

ELEC 5602 [0.5 credit] (ELG 6362)

#### **Microwave Semiconductor Devices and Applications**

Theory of operation for microwave diodes (varactor, p-i-n, Gunn, IMPATT) and transistors (BJT, MESFET, HBT, HEMT). Small-signal, large-signal, and noise models for CAD. Diode oscillators and reflection amplifiers. Design of transistor oscillators and amplifiers. Discussion of technology/fabrication issues and MMIC applications.

ELEC 5604 [0.5 credit] (ELG 6364)

#### **Radar Systems**

Fundamentals; range equation, minimum detectable signal, radar cross-section, pulse repetition frequency, range ambiguities. Radar classes: CW, FM-CW, MTI, tracking, air surveillance, SSR, PAR, MLS, SAR, SLAR, OTH, 3D and bistatic radars. Radar subsystems; transmitters, antennas, receivers, processors, displays, detection criteria; CFAR receivers, noise, clutter precipitation.

ELEC 5605 [0.5 credit] (ELG 6365)

#### **Optical Fibre Communications**

Transmission characteristics of and design considerations for multi-mode and single-mode optical fibre waveguides; materials, structures, and device properties of laser light sources; properties and performance of p-i-n and avalanche photodiodes; types of optical fibre signal formats, preamplifier topologies, noise, receiver sensitivity, transmitter design, link design.

ELEC 5606 [0.5 credit] (ELG 6366)

#### **Phase-Locked Loops and Receiver Synchronizers**

Phase-locked loops; components, fundamentals, stability, transient response, sinusoidal operation, noise performance, tracking, acquisition and optimization. Receiver synchronizers: carrier synchronizers including squaring loop, Costas loop, and remodulator for BPSK, QPSK BER performance; clock synchronizers including early-late gate, in-phase/midphase, and delay line multiplier.

ELEC 5607 [0.5 credit] (ELG 6367)

#### **Antennas and Arrays**

Design projects are interspersed with live and video lectures. Lectures cover definitions, wire structures, mutual coupling, method-of-moments, array theory, photonic devices, frequency independent structures, reflectors, horns, feeds, slotted waveguide and microstrip arrays. Design projects include a printed dipole, yagi and series-fed microstrip patch array.

ELEC 5608 [0.5 credit] (ELG 6368)

#### **Fourier Optics**

The theory and applications of diffractive and non-diffractive coherent optics, with emphasis on holograms, tomography and high-speed optical computing. Mathematical basis: generalized 2-D Fourier transforms, transfer function of an optical system, 2-D sampling theory, Helmholtz equation, Green's theorem, and the classical diffraction theories.

ELEC 5609 [0.5 credit] (ELG 6369)

#### **Nonlinear Microwave Devices and Effects**

The physical basis and mathematical modeling of a variety of microwave/millimeter-wave devices, (some of which exhibit the most extreme nonlinear behaviour known), how they can be exploited in practical circuits and systems, and how the resulting device/circuit interactions can be analyzed.

ELEC 5701 [0.5 credit] (ELG 6371)

#### **Fibre and Waveguide Components for Communications and Sensors**

Optical wave propagation in dielectric waveguides. Theory and practice for passive photonic devices used for routing, filtering, and signal processing, including structural and biochemical sensors. Directional couplers and splitters, filters (gratings and etalons), Mach-Zehnder interferometers, Arrayed waveguide gratings, and dispersion compensators.

Precludes additional credit for this course taken previously as a special topics course ELEC 5709W (ELG 6379W).

Prerequisites: ELEC 3909 or equivalent.

ELEC 5702 [0.5 credit] (ELG 6372)

#### **Optical Electronics**

Electromagnetic wave propagation in crystals; review of geometric optics; Gaussian beam propagation; optical fibres; dielectric waveguides for optical integrated circuits; optical resonators; optical properties of materials; theory of laser oscillation; specific laser systems; electro-optic modulators; photorefractive materials and applications; holography; optical interconnects.

ELEC 5703 [0.5 credit] (ELG 6373)

#### **Advanced Topics in Solid State Devices and IC Technology**

Recent and advanced topics in semiconductor device physics, modeling, and integrated circuit fabrication technology. Topic varies from year to year according to departmental research interests. Students may be expected to contribute lectures or seminars on selected topics.

ELEC 5704 [0.5 credit] (ELG 6374)

#### **Advanced Topics in CAD**

Recent and advanced topics in computer-aided techniques for the design of VLSI and telecommunications circuits. Topics will vary from year to year according to the departmental research interests. Students may be expected to contribute lectures or seminars on selected topics.

ELEC 5705 [0.5 credit] (ELG 6375)

#### **Advanced Topics in VLSI**

Recent and advanced topics in the design of very large scale integrated circuits, with emphasis on mixed analog/digital circuits for telecommunications applications. Topic varies from year to year according to departmental research interests. Students may be expected to contribute lectures or seminars on selected topics.

ELEC 5706 [0.5 credit] (ELG 6376)

#### **Submicron CMOS and BiCMOS Circuits for Sampled Data Applications**

The analog aspects of digital CMOS and BiCMOS circuit design in submicron technologies including reliability; sampled analog circuits, including amplifier non-ideal characteristics and switch charge injection; CMOS/BiCMOS amplifier design considerations, leading up to standard folded-cascode and two-stage circuits.

ELEC 5707 [0.5 credit] (ELG 6377)

**Microsensors and MEMS**

Physical design of microelectromechanical systems (MEMS) and microfabricated sensors and actuators. An overview of thin and thick film processes and micromachining techniques will provide fabrication background. Device design including piezoresistive, piezoelectric, electromagnetic, thermal, optical, and chemical sensors and actuators.

ELEC 5708 [0.5 credit] (ELG 6378)

**ASICs in Telecommunications**

Introduction to modern ASIC technologies for Telecom. Review of circuit-level building blocks for typical wireline and wireless applications, including power/performance tradeoffs. Corresponding FPGA analog and digital IO circuits are discussed. A topical literature study and circuit level design exercises.

ELEC 5709 [0.5 credit] (ELG 6379)

**Advanced Topics in Electromagnetics**

Recent and advanced topics in electro-magnetics, antennas, radar systems, microwave devices and circuits, or optoelectronics. The subject material will vary from year to year according to research interests in the department and/or expertise provided by visiting scholars or sessional lecturers.

ELEC 5800 [0.5 credit] (ELG 6380)

**Theory of Semiconductor Devices**

Equilibrium and non-equilibrium conditions in a semiconductor. Carrier transport theory. Physical theory of basic semiconductor device structures and aspects of design: PN junctions and bipolar transistors, field effect devices. Current transport relationships for transistors. Charge control theory. Modeling of device mechanisms. Performance limitations of transistors.

ELEC 5801 [0.5 credit] (ELG 6381)

**High-Speed and Low-Power VLSI**

High-Speed and Low-Power CMOS VLSI circuit techniques. Low and high levels of abstraction; transistor, switch, logic-gate, module, system levels. State-of-the-art techniques to optimize the performance and energy consumption of a circuit. One or more of these techniques are used in a design project.

Prerequisite: ELEC 4708 or ELEC 5804 or the equivalent or permission of the instructor.

ELEC 5802 [0.5 credit] (ELG 6382)

**Surface-Controlled Semiconductor Devices**

Fundamentals of the MOS system; MOS capacitors. Long channel behaviour: theory, limitations and performance of the SPICE level 1 and 2 models. Small geometry effects. Subthreshold operation and modeling. Hot electron effects and reliability.

ELEC 5803 [0.5 credit] (ELG 6383)

**Behavioural Synthesis of ICs**

Various topics related to computer analysis and synthesis of VLSI circuits including: logic synthesis, finite state machine synthesis, design methodologies, design for reuse, testing, common VLSI functions, a review of Verilog.

Prerequisite: Some IC design knowledge such as given in ELEC 4708.

ELEC 5804 [0.5 credit] (ELG 6384)

**VLSI Design**

An IC design course with a strong emphasis on design methodology, to be followed by ELEC 5805 (ELG 6385). in the second term. The design philosophies considered will include Full Custom design, standard cells, gate-arrays and sea-of-gates using CMOS and BiCMOS technology. State-of-the-art computer-aided design tools are used.

ELEC 5805 [0.5 credit] (ELG 6385)

**VLSI Design Project**

Using state-of-the-art CMOS and BiCMOS technologies, students will initiate their own design of an integrated circuit using tools in the CAD lab and submit it for fabrication where the design warrants.

ELEC 5808 [0.5 credit] (ELG 6388)

**Signal Processing Electronics**

CCDs, transversal filters, recursive filters, switched capacitor filters, with particular emphasis on integration of analog signal processing techniques in monolithic MOS ICs. Detailed op amp design in CMOS technology. Implications of nonideal op amp behaviour in filter performance. Basic sampled data concepts.

ELEC 5809 [0.5 credit] (ELG 6389)

**Nonlinear Electronic Circuits**

Introduction to non-linear circuits used in today's telecommunications ICs; CMOS non-linear circuits such as direct-RF-sampling mixers, phase-detectors; digital loop-filters, DCOs, frequency synthesizers and clock-and-data-recovery are introduced. Modeling of these non-linear circuits and existing options for simulations and closed form circuit analysis is presented.

Precludes additional credit for this course taken previously as a special topics course ELEC 5705 (ELG 6375).

Prerequisite: permission of the Department.

ELEC 5900 [0.5 credit]

**Engineering Project I**

A one-term course, carrying 0.5 credit, for students pursuing the course work M.Eng. program. An engineering study, analysis and/or design project under the supervision of a faculty member. Written and oral reports are required. This course may be repeated for credit.

ELEC 5901 [1.0 credit]

**Engineering Project II**

A one-term course, carrying full-course credit, for students pursuing the course work or co-op M.Eng. program. An engineering study, analysis and/or design project under the supervision of a faculty member. Written and oral reports are required. This course may be repeated for credit.

ELEC 5906 [0.5 credit]

**Directed Studies**

Various possibilities exist for pursuing directed studies on topics approved by a course supervisor, including the above listed course topics where they are not offered on a formal basis.

ELEC 5909 [2.0 credits]

**M.A.Sc. Thesis**

ELEC 6909 [8.5 credits]

**Ph.D. Thesis**



## English Language and Literature

### Department of English

ENGL 5002 [0.5 credit]

#### Studies in Theory I

Selected topics in literary and cultural theory.

ENGL 5004 [0.5 credit]

#### Studies in Transnational Literatures

Topics in transnational, diaspora and postcolonial literatures and theory. Topics vary from year to year.

ENGL 5005 [0.5 credit]

#### M.A. Seminar

Examines topics such as research resources and methodologies, current issues in literary theory and professional concerns. Graded Satisfactory/Unsatisfactory.

ENGL 5006 [0.5 credit]

#### Studies in Theory II

Selected topics in literary and cultural theory.

ENGL 5007 [0.5 credit]

#### Studies in Indigenous Literatures

Selected texts of Indigenous literature and culture. Topics may vary from year to year.

ENGL 5008 [0.5 credit]

#### Studies in African Literature

Selected texts of African literature and culture. Topics may vary from year to year.

ENGL 5009 [0.5 credit]

#### Studies in South Asian Literature

Selected texts of South Asian literature and culture. Topics vary from year to year and may be organized by theme, author, or genre.

ENGL 5010 [0.5 credit]

#### Studies in Caribbean Literature

Topics in Caribbean literatures and theory. Topics vary from year to year.

ENGL 5207 [0.5 credit]

#### Studies in Anglo-Saxon Literature

Topics in early medieval period. Topics vary from year to year and may include Old English, Old Norse, Latin texts in translation, or pre-Chaucerian texts.

ENGL 5208 [0.5 credit]

#### Studies in Middle English Literature

Studies in the literature and culture of England between 1100 and 1550. Topics vary from year to year and may include texts in Middle English, French and/or Latin (French and Latin texts are usually studies in translations).

ENGL 5303 [0.5 credit]

#### Studies in Early Modern Literature I

A study of early modern authors, texts, and problems. Topics may vary from year to year.

ENGL 5305 [0.5 credit]

#### Studies in Early Modern Literature II

A study of early modern authors, texts, and problems. Topics will vary from year to year.

ENGL 5402 [0.5 credit]

#### Studies in Eighteenth-Century Literature

Selected texts of eighteenth-century literature and culture. Topics may vary from year to year.

ENGL 5408 [0.5 credit]

#### Studies in Romanticism

Selected texts of Romantic literature and culture. Topics vary from year to year and may be organised by theme, author or genre.

ENGL 5501 [0.5 credit]

#### Studies in Nineteenth-Century Literature I

Selected readings in nineteenth-century British literature and culture. Topics vary from year to year and may be organized by theme, author, and/or genre.

ENGL 5503 [0.5 credit]

#### Studies in Nineteenth-Century Literature II

Selected readings in nineteenth-century British literature and culture. Topics vary from year to year and may be organized by theme, author, and/or genre.

ENGL 5606 [0.5 credit]

#### Studies in Twentieth-Century Literature

Selected texts of twentieth-century literature and culture. Topics may vary from year to year.

ENGL 5608 [0.5 credit]

#### Studies in Modernism

Special topics in studies in modernism will vary from year to year.

ENGL 5609 [0.5 credit]

#### Studies in American Literature I

Selected texts of American literature and culture. Topics may vary from year to year.

ENGL 5610 [0.5 credit]

#### Studies in Contemporary Literature I

Selected texts of contemporary literature and culture. Topics may vary from year to year.

ENGL 5611 [0.5 credit]

#### Studies in Contemporary Literature II

Selected texts of contemporary literature and culture.

ENGL 5708 [0.5 credit]

#### Studies in American Literature II

Topic may vary from year to year.

ENGL 5804 [0.5 credit]

#### Studies in Canadian Literature I

Topics vary from year to year and may include issues of genre, selected themes, literary movements, or developments in theory.

ENGL 5806 [0.5 credit]

#### Studies in Canadian Literature II

Topics vary from year to year and may include issues of genre, selected themes, literary movements, or developments in theory.

ENGL 5900 [0.5 credit]

#### Selected Topic in English Studies I

Topic may vary from year to year.

ENGL 5901 [0.5 credit]

#### Selected Topic in English Studies II

Topic may vary from year to year.

ENGL 5908 [1.0 credit]

#### Research Essay

ENGL 5909 [2.0 credits]

#### M.A. Thesis

ENGL 6000 [1.0 credit]

#### Doctoral Seminar

Issues related to the production of literature as a material object, as an institutional site or practice, and as an enabling concept.

ENGL 6001 [0.5 credit]

#### Proseminar

Exploration of recent critical theory and discussion of issues related to the profession.

ENGL 6101 [0.5 credit]

#### Directed Reading

This tutorial is designed to permit students to pursue individual research. Topics will be chosen in consultation with at least one faculty member and the graduate supervisor.



ENGL 6102 [0.5 credit]

**Studies in the Production of Literature**

Explores selected studies/themes related to the production of literature.

ENGL 6103 [0.5 credit]

**Selected Topics in the Production of Literature**

Selected topics/themes related to the production of literature.

ENGL 6900 [1.0 credit]

**Comprehensive Examination**

This examination will include a range of topics related to the production of literature as a material object, as an institutional site or practice, and as an enabling concept.

ENGL 6901 [1.0 credit]

**Doctoral Research Project**

This project will comprise both an essay of publishable length and an oral defense in the general area of the project.

ENGL 6909 [4.5 credits]

**Thesis**

## Environmental Engineering (ENVE)

### Department of Civil and Environmental Engineering

ENVE 5001 [0.5 credit] (CVG 7160)

#### Biofilm Processes

Physical, chemical properties, microbial ecology of biofilms. Biofilm processes, attachment, growth, sloughing. Transport and interfacial transfer phenomena; mass transfer models, mass transport in biofilms, deposition of solids. Modeling biofilm systems; species models, mass balance equations, boundary conditions, moving boundary problem, analytical and numerical solutions.

ENVE 5101 [0.5 credit] (EVG 7101)

#### Air Pollution Control

Air quality and pollution; definitions, measurement and monitoring methods. Criteria pollutants, air toxics, particulate matter, secondary pollutants. Pollutant formation mechanisms. Major sources and control methods. Meteorology and principles of dispersion modeling. Principles of receptor modeling. Indoor air quality.

Also offered at the undergraduate level, with different requirements, as ENVE 4003, for which additional credit is precluded.

ENVE 5102 [0.5 credit] (CVG 7161)

#### Traffic-Related Air Pollution

Pollutant formation, emission characterization, emission control technology and emission modeling from motor vehicles. Dispersion and receptor modeling for conservative pollutants in urban microenvironments. Personal exposure and health risk assessment.

ENVE 5103 [0.5 credit] (CVG 7162)

#### Air Quality Modeling

Dispersion modeling for simple and complex sources and complex terrain. Physical and chemical transformations for pollutants in the atmosphere. Urban and regional air pollution modeling for reactive pollutants. The urban air shed model. Regional air quality modeling case studies.

ENVE 5104 [0.5 credit] (EVG 7104)

#### Indoor Air Quality

Indoor air quality as a component of the indoor environment; physical and chemical parameters for characterization. Types and sources of indoor air pollution, measurement techniques. Heating, ventilation, and air conditioning practices and issues. The human factor in identifying and controlling indoor air pollution.

ENVE 5201 [0.5 credit] (EVG 7201)

#### Geo-Environmental Engineering

Landfill design; hydrogeologic principles, water budget, landfill liners, geosynthetics, landfill covers, quality control and quality assurance, clay/leachate interaction, composite liner design and leachate collection systems. Landfill operation, maintenance and monitoring. Design of environmental control and containment systems; slurry walls, grout curtains, Case studies.

Also offered at the undergraduate level, with different requirements, as ENVE 4002, for which additional credit is precluded.

ENVE 5202 [0.5 credit] (EVG 7202)

#### Contaminant Fate Mechanisms

Mechanisms and chemical properties influencing the fate of toxic contaminants in environmental systems; liquid-gas partitioning and mass transfer, liquid-solid partitioning, abiotic and biotic degradation of toxics. Fate of toxics in wastewater collection and

treatment systems. Treatment of residual streams; sludges, air streams. Mechanisms influencing the fate of toxic contaminants in aquatic and subsurface environments.

ENVE 5203 [0.5 credit] (EVG 5203)

#### Hazardous & Radioactive Wastes

Classification of hazardous, radioactive and mixed wastes, hazardous waste treatment processes, wastes generated in the nuclear fuel cycle, radioactive waste classification, radioactive waste treatment and management of residuals, engineered systems for long-term isolation and disposal, mixed waste management.

Also offered at the undergraduate level, with different requirements, as ENVE 4101, for which additional credit is precluded.

ENVE 5301 [0.5 credit] (EVG 7301)

#### Contaminant Hydrogeology

Theory of flow through porous media; soil characterization, soil properties, anisotropy, heterogeneity. Contaminant transport. Well hydraulics and pump tests. Introduction to numerical modeling; finite difference, finite elements, conceptual model, boundary conditions. Site remediation and remediation technologies.

Also offered at the undergraduate level, with different requirements, as ENVE 4006, for which additional credit is precluded.

ENVE 5302 [0.5 credit] (CVG 7163)

#### Case Studies in Hydrogeology

Development of a conceptual model; chemistry, geology and hydrology, site characterization, initial and boundary conditions. Application of industry-recognized computer codes to model flow and contaminant transport at a particular site. Evaluation of remedial alternatives at a site. Modeling of the more common remediation technologies (soil vapour extraction, air sparging, pump and treat, biodegradation).

ENVE 5303 [0.5 credit] (EVG 7303)

#### Multiphase Flow in Soils

Theory of unsaturated flow and multiphase flow; capillary pressure-saturation relationships, relative permeability relationships, wettability, hysteresis, fluid entrapment, residual saturations, governing equations for flow and transport. Richard's Equation for unsaturated flow. Modeling of multiphase flow.

ENVE 5401 [0.5 credit] (EVG 7401)

#### Env. Impacts of Major Projects

Regulatory framework and impact assessment requirements for project approvals, survey of the components of the EIA process and methodology, the review process, public participation in environmental decision-making, preparation of the EIA document, case studies of major engineering projects.

ENVE 5402 [0.5 credit] (EVG 7402)

#### Finite Elements in Field Problems

Use of Galerkin and Ritz finite element formulations to solve one and two dimensional field problems. Steady state and time-dependent phenomena involving heat transfer, fluid flow, diffusion, and dispersion with emphasis on practical applications. Basic knowledge of third year-level undergraduate engineering mathematics and physics required.

ENVE 5701 [0.5 credit] (EVG 7301)

#### Topics in Environmental Engineering

Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5702 [0.5 credit] (EVG 7302)

**Topics in Environmental Engineering**

Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5703 [0.5 credit] (EVG 7303)

**Topics in Environmental Engineering**

Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5704 [0.5 credit] (EVG 7304)

**Topics in Environmental Engineering**

Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5705 [0.5 credit] (EVG 7305)

**Topics in Environmental Engineering**

Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5800 [0.0 credit]

**Master's Seminar**

The series consists of presentations by graduate students or external speakers. Graduate students in the Environmental Engineering program are required to participate in these seminar series by attending all seminars and making at least one presentation during their graduate studies.

ENVE 5900 [1.0 credit]

**Environmental Engineering Project**

Students enrolled in the M.Eng. program by course work will conduct an engineering study, analysis, or design project under the general supervision of a member of the Department.

ENVE 5906 [0.5 credit] (EVG 6108)

**Directed Studies 1**

Precludes additional credit for CIVE 5906.

ENVE 5907 [0.5 credit] (EVG 6109)

**Directed Studies 2**

Precludes additional credit for CIVE 5907.

ENVE 5909 [3.0 credits]

**Master's Thesis**

ENVE 6909 [8.5 credits]

**Ph.D. Thesis**

ENVE 7800 [0.0 credit]

**Ph.D. Seminar**

The series consists of presentations by graduate students or external speakers. Graduate students in the Environmental Engineering program are required to participate in these seminar series by attending all seminars and making at least one presentation during their graduate studies.

## European, Russian and Eurasian Studies (EURR)

### Institute of European, Russian and Eurasian Studies

EURR 5000 [0.5 credit]

#### **Social Science Approaches to Communist and Post-Communist Studies**

An overview of social science approaches to the field of study for students with limited background in the field. The course is open to graduate students from a variety of departments.

Prerequisite: permission of the Institute.

EURR 5001 [0.5 credit]

#### **Interdisciplinary Seminar in European and Russian Studies**

Current debates and methodological approaches within various academic disciplines relating to Europe, Russia, and Eurasia.

Prerequisite: permission of the Institute or enrolment in the EURUS program.

EURR 5002 [0.5 credit]

#### **Post-Soviet States and Societies**

The relationship between social forces and state structures at both the national and local levels in the USSR and the post-soviet states. (Also listed as PSCI 5110)

Precludes additional credit for EURR 4002.

EURR 5003 [0.5 credit]

#### **Social and Political Perspectives in Europe**

Social issues and policies in the European Union including European identity, democratic legitimacy, nationalist and extremist political movements, Euroscepticism, migration and immigration, social inclusion/exclusion and social models, gender and family policy, regional differentiation. Also offered at the undergraduate level with different requirements as EURR 4003, for which additional credit is precluded.

EURR 5005 [0.5 credit]

#### **Environmental Problems and Politics in East/Central Europe and Eurasia**

Nature, origins and policy responses viewed from economic, political and geographic perspectives. Also offered at the undergraduate level, with different requirements, as EURR 4005, for which additional credit is precluded.

Prerequisite: 1.0 credit in the area of East European or environmental studies, or permission of the Institute.

EURR 5007 [0.5 credit]

#### **Social and Political Discourse in Russia**

Contemporary social and political issues as covered in Russian-language media. Most course reading and instruction is in the Russian language but student participation may be in English or Russian. Also offered at the undergraduate level, with different requirements, as EURR 4007, for which additional credit is precluded.

Prerequisite: appropriate facility in the Russian language and permission of the Institute.

EURR 5008 [0.5 credit]

#### **Nationalism and Ethnic Conflict in Eastern and Central Europe**

Ethnic basis of nationalism in the region. Ethnic politics and trends.

Precludes additional credit for EURR 4008.

EURR 5100 [0.5 credit]

#### **Nation-Building in Central and Eastern Europe**

Processes of nation-building in the region examined in terms of a particular country, or set of countries. Country focus may vary. Also offered at the undergraduate level, with different requirements, as EURR 4100, for which additional credit is precluded.

EURR 5102 [0.5 credit]

#### **The International Political Economy of Transition**

Problems of reintegration into the world economy and dilemmas of transition from command to market economies. Topics may include new trade and investment patterns, role in regional and international economic organizations, search for appropriate exchange rate policies, impact of Western assistance. (Also listed as INAF 5802.)

EURR 5103 [0.5 credit]

#### **Sustainability and Development in the Arctic: Transformations in the Circumpolar North**

The Circumpolar Arctic Region is undergoing rapid political, economic, social and technological development, which impacts sustainability. Climate, contaminants and biological diversity focus international attention. Nunavut, the Russian North, major developments, and international circumpolar regime formation, with emphasis on environment and development.

EURR 5104 [0.5 credit]

#### **European Integration and European Security**

A seminar focusing on security issues related to the formation of supra-national decision-making structures in Europe. Also offered at the undergraduate level with different requirements, as EURR 4104, for which additional credit is precluded. (Also listed as PSCI 5608.)

EURR 5105 [0.5 credit]

#### **European Economic Integration**

Economic issues and policies related to the process of European integration and the development of the post-World War II European Union.

Prerequisite: ECON 1000.

EURR 5106 [0.5 credit]

#### **Selected Topics in European Integration Studies**

Selected topics related to post-World War II European integration.

(Also listed as PSCI 5609.)

EURR 5107 [0.5 credit]

#### **Russia and the New World Order, 1992 to the Present**

An examination of how the Russian Federation has sought a place for itself in the world order since the collapse of the USSR.

Precludes additional credit for EURR 4107.

EURR 5108 [0.5 credit]

#### **Canada-EU Relations: Summer Module**

Relations between Canada and Europe in the context of European integration, with attention to policy issues affecting the relationship and/or areas of common policy challenges.

Precludes additional credit for EURR 5106 and PSCI 5609 if taken in the summer of 2003-2004 or 2004-05. (Also listed as PSCI 5103).

Prerequisite: previous course in European integration or permission of the instructor.

Intensive two-week summer module.



EURR 5200 [0.5 credit]

**Interdisciplinary Seminar on Russian, Eurasian and Transition Studies**

Particular issues in post-communist transition. Discussion of student research proposals. Precludes additional credit for EURR 5300.

EURR 5201 [0.5 credit]

**Special Topics in European Studies**

Selected topics related to Europe and/or the European Union.

EURR 5202 [0.5 credit]

**Special Topics in Russian, Eurasian, and Transition Studies**

Selected topics related to the communist and post-communist states and processes of transition they are undergoing.

EURR 5203 [0.5 credit]

**Imperial and Soviet Russia**

Legacies of the tsarist empire and the Soviet Union that influence the region today. Topics include political culture, empire, socialism, class, gender, and non-Russian peoples. Also offered at the undergraduate level with different requirements as EURR 4203, for which additional credit is precluded. Also listed as HIST 5603.

EURR 5204 [0.5 credit]

**Central Europe, Past and Present**

Evolution and current status of Central Europe from periods of foreign control in the late nineteenth and twentieth centuries to independent statehood. Emphasis on national accommodations and conflicts. Also offered at the undergraduate level with different requirements as EURR 4204, for which additional credit is precluded. Also listed as HIST 5604.

EURR 5205 [0.5 credit]

**The European Union and its Eastern Neighbours**

The EU's European Neighbourhood Policy and Eastern partnership policy, the Russia-EU "strategic partnership". Policies and reactions of non-EU East European countries toward the EU. The interaction of Member state policies and EU policies. May include attention to historical legacies, cultural factors, public opinion, energy security.

EURR 5300 [0.5 credit]

**Interdisciplinary Seminar on European and European Union Studies**

Particular issues in EU member countries as well as processes of European integration and EU enlargement. Discussion of student research proposals. Precludes additional credit for EURR 5200.

EURR 5301 [0.5 credit]

**Internship and Applied Policy Skills**

A seminar accompanying an unpaid internship placement to develop workplace and applied policy skills. Relating applied experience to academic literature. Writing skills for an applied policy setting. Also listed as EURR 4206, for which additional credit is precluded.

Prerequisite: Open only to EURUS MA students with a minimum B+ average and placement in an internship position in the same semester or in the previous semester (based on a competitive application process). Internship placement: 12 days over 12 weeks. Seminars: six three-hour seminar sessions.

EURR 5302 [0.5 credit]

**EU Summer Study Abroad**

This course is open only to students in approved summer study options in Europe, particularly the EU Study Tour. Also offered at the undergraduate level, with additional or different requirements, as EURR 4302, for which additional credit is precluded. Prerequisite: approval of the Institute.

EURR 5809 [0.0 credit]

**Seminar in European Integration Studies**

Each student must present a paper relating to European integration that was prepared for another diploma course. Diploma students are expected to attend presentations by other students and other seminar talks. Open only to students registered in the Diploma in European Integration Studies.

EURR 5900 [0.5 credit]

**Tutorial in Russian-Area Studies**

Directed readings on selected aspects of the Soviet successor states, involving preparation of papers as the basis for discussion with the tutor. Offered to meet specific program needs.

EURR 5901 [0.5 credit]

**Tutorial in Russian, Eurasian and Transition Studies**

Directed readings on selected aspects of Russian, Eurasian and Transition issues.

Prerequisite: permission of the Institute.

EURR 5902 [0.5 credit]

**Tutorial in European and European Union Studies**

Directed readings on selected aspects of European and European Union issues.

Prerequisite: permission of the Institute.

EURR 5903 [0.5 credit]

**Tutorial in European and European Union Studies**

Directed readings on selected aspects of European and European Union issues.

Prerequisite: permission of the Institute.

EURR 5908 [1.0 credit]

**Research Essay**

A research essay on a topic relating to European, Russian or Eurasian Studies.

EURR 5909 [2.0 credits]

**M.A. Thesis**

Prerequisite: permission of the Institute.

EURR 5910 [0.0 credit]

**Co-operative Work Term 1**

Prerequisite: registration in the Co-operative Education Program option in the M.A. program in European, Russian, and Eurasian Studies.

EURR 5911 [0.0 credit]

**Co-operative Work Term 2**

Prerequisite: registration in the Co-operative Education Program option in the M.A. program in European, Russian, and Eurasian Studies.

## Film Studies (FILM)

### School for Studies in Art and Culture

FILM 5000 [1.0 credit]

#### Directions in Film Theory and Film History

Recent developments in film theory and history, with emphasis on the themes and concepts informing the development of the discipline of film studies.

FILM 5001 [0.5 credit]

#### Directed Readings and Research

Tutorials designed to permit students to pursue research on topics in film studies which have been chosen in consultation with members of faculty.

FILM 5002 [0.5 credit]

#### Special Topics

Selected topics in film studies not available in the regular course program.

FILM 5106 [0.5 credit]

#### Cinema and Technology

Selected aspects of the technological development of cinema, with emphasis on the impact of technological advances on film historiography and critical analysis.

FILM 5107 [0.5 credit]

#### Topics in Film History

Aspects of the history of cinema, with emphasis on periods, film movements, styles, genres and comparative approaches to national, regional and/or world-wide trends.

FILM 5203 [0.5 credit]

#### Issues in World Cinema

Study of the theoretical and methodological issues raised by the concept of world cinema. Topics may include nationalism, transnationalism, translation, cosmopolitanism, local and regional vernaculars, co-productions, film festivals, multinational corporations and other phenomena associated to globalization.

FILM 5205 [0.5 credit]

#### Topics in Hollywood Cinema

Examination of Hollywood cinema relative to recent research into Hollywood's impact on film aesthetics, technology, economics and culture.

FILM 5209 [0.5 credit]

#### Critical Perspectives on Canadian Cinema

Current critical and historical approaches to Canadian film, with emphasis on institutions, aesthetic traditions and cultural practices.

FILM 5401 [0.5 credit]

#### Studies in Authorship

Examination of the work of one or two filmmakers, with a concern for recent ideas about the concept of authorship and the formation of artistic and critical reputations.

FILM 5500 [0.5 credit]

#### Advanced Film Analysis

Issues and approaches to the detailed analysis of particular film texts. Work in narratology, hermeneutics, discourse analysis, psychoanalysis, deconstruction and semiotics will provide the methodological background to the study of individual films.

FILM 5506 [0.5 credit]

#### Topics in Culture, Identity and Representation

Current critical approaches to the study of identity in cinema. Topics will vary from year to year, and may include race, ethnicity and sexuality, and the geopolitical implications of colonialism and post-colonialism.

FILM 5601 [0.5 credit]

#### Studies in Genre

The theory and practice of film genres will be the object of study in this course.

FILM 5701 [0.5 credit]

#### Topics in Animation

Institutional histories, the work of individual animators, modes of production, and the social function of animation represent topics to be covered by this course.

FILM 5801 [0.5 credit]

#### Graduate Internship

This course provides students with the opportunity to gain practical experience by working on film-related projects under the supervision of staff at a museum, gallery, archive, exhibition venue or government agency. Graded SAT/UNS.

FILM 5805 [0.5 credit]

#### Professional Workshops

Introduction to film-related careers through direct contact with professionals involved in film archiving, curatorship and film festival programming, cultural policy and media arts funding. Graded SAT/UNS. Three hours a week, every two weeks.

FILM 5908 [1.0 credit]

#### Research Essay

Individual project on a topic of the student's choice involving research undertaken after admission into the program and supervised by a faculty member.

FILM 5909

#### M.A. Thesis

FILM 5910 [0.5 credit]

#### M.A. Comprehensive Examination

## Finance (FINA)

### Sprott School of Business

FINA 5501 [0.25 credit]

#### **Financial Management**

Overview of finance from the perspective of the financial manager. Corporate governance issues, financial markets, time value of money, valuation and yields of financial securities, capital budgeting, financial statement analysis, and the trade-off between risk and return.

Precludes additional credit for BUSI 5504.

FINA 5502 [0.25 credit]

#### **Corporate Finance**

Aspects of corporate finance of most concern to managers: investment, financing and payout decisions, corporate restructuring. Case studies will be used.

Prerequisite: FINA 5501.

FINA 5511 [0.25 credit]

#### **Investments**

The analytical foundations and tools necessary for successful decision making by investment managers and analysts and by individual investors. Includes a significant hands-on component.

FINA 5512 [0.25 credit]

#### **Valuation**

Valuation techniques needed for enterprise valuation. The identification of value drivers, insights into the valuation of companies in different settings. Step-by-step procedures for valuing businesses. Includes a team case analysis and presentation.

FINA 5513 [0.25 credit]

#### **Mergers and Acquisitions**

Theory and practice of mergers and acquisitions. Skills needed to be effective in mergers and acquisitions. Best practices in deal origination, design, implementation and post merger integration.

Precludes additional credit for BUSI 5500.

Prerequisite: FINA 5512.

FINA 5514 [0.25 credit]

#### **International Finance**

Issues encountered by the multinational financial manager in making financing and investment decisions within a global context. Foreign exchange markets, parity conditions, currency quotation methods, management of foreign exchange/political risk and international capital budgeting.

FINA 5521 [0.25 credit]

#### **Financial Management Concentration Integration**

Integrates and applies all the accounting and finance concentration coursework. Critical thinking is stressed via the case study approach. Focuses on complex problems and allows students to gain a deeper understanding of the salient issues discussed within the financial management concentration.

Precludes additional credit for BUSI 5500.

## French (FREN)

### Department of French

FREN 5001 [0.5 credit]

#### **Théories linguistiques françaises**

Analyse linguistique d'un ou plusieurs aspects de la langue française à partir d'une perspective théorique qui sera précisée. Le contenu précis de ce cours varie selon les années. Also offered at the undergraduate level, with different requirements as FREN 4414, for which additional credit is precluded when topics are the same.

FREN 5002 [0.5 credit]

#### **Linguistique du français I**

Étude du français par l'intermédiaire de l'analyse portant sur des sources variées. Le contenu précis de ce cours varie selon les années. Also offered at the undergraduate level, with different requirements, as FREN 4415, for which additional credit is precluded when topics are the same.

FREN 5003 [0.5 credit]

#### **Linguistique du français II**

Réflexions sur des problèmes théoriques liés à la linguistique du français. Le contenu précis de ce cours varie selon les années. Also offered at the undergraduate level, with different requirements, as FREN 4412, for which additional credit is precluded when topics are the same.

FREN 5004 [0.5 credit]

#### **Linguistique du français canadien**

Regard sur la diversité du français parlé au Canada d'un point de vue diachronique, synchronique ou les deux. Le contenu précis de ce cours varie selon les années.

FREN 5200 [0.5 credit]

#### **Aspect linguistique particulier**

Étude approfondie d'un aspect de la prononciation, de la grammaire ou du lexique français. Le contenu précis de ce cours varie selon les années. Also offered at the undergraduate level, with different requirements, as FREN 4413, for which additional credit is precluded when topics are the same.

FREN 5300 [0.5 credit]

#### **Méthodologie de la recherche**

Initiation au monde de la recherche, aux techniques de documentation, à l'exploitation des ressources bibliographiques, à l'élaboration d'un problème de recherche, à l'organisation d'un programme de recherche, aux enjeux épistémologiques de la recherche universitaire.

FREN 5301 [0.5 credit]

#### **Méthodologie de la recherche II**

Réalisation d'un projet de recherche. Participation à un programme d'activités axées sur la recherche.

FREN 5400 [0.5 credit]

#### **Théories littéraires**

Étude de théories ciblées dans le champ des études littéraires. Le contenu précis de ce cours varie selon les années.

FREN 5403 [0.5 credit]

#### **Littérature et idéologie**

Études des rapports entre la production littéraire et les discours idéologiques. Le contenu précis de ce cours varie selon les années.

FREN 5404 [0.5 credit]

#### **Auteurs I**

Étude approfondie de l'œuvre d'un auteur francophone. Le contenu précis de ce cours varie selon les années.

FREN 5405 [0.5 credit]

#### **Thèmes, mouvements, genres**

Étude approfondie d'un thème, d'un mouvement, d'un genre dans le champ littéraire. Le contenu précis de ce cours varie selon les années. Also offered at the undergraduate level, with different requirements, as FREN 4214, for which additional credit is precluded when topics are the same.

FREN 5408 [0.5 credit]

#### **Littérature française I**

Étude approfondie d'un aspect particulier de la littérature française. Le contenu précis de ce cours varie selon les années.

FREN 5409 [0.5 credit]

#### **Littérature française II**

Étude approfondie d'un aspect particulier de la littérature française. Le contenu précis de ce cours varie selon les années.

FREN 5500 [0.5 credit]

#### **Littératures d'expression française au Canada I**

Étude approfondie portant sur un ou plusieurs aspects des littératures d'expression française au Canada. Le contenu précis de ce cours varie selon les années. Also offered at the undergraduate level, with different requirements, as FREN 4213, for which additional credit is precluded when topics are the same.

FREN 5501 [0.5 credit]

#### **Littératures d'expression française au Canada II**

Étude approfondie portant sur un ou plusieurs aspects des littératures d'expression française au Canada. Le contenu précis de ce cours varie selon les années.

FREN 5600 [0.5 credit]

#### **Littératures du monde francophone**

Analyse de problématiques liées à la francophonie littéraire. Le contenu précis de ce cours varie selon les années. Also offered at the undergraduate level, with different requirements, as FREN 4212, for which additional credit is precluded when topics are the same.

FREN 5603 [0.5 credit]

#### **Littérature et les autres arts**

Étude des rapports entre l'art littéraire et d'autres formes d'expression artistique. Le contenu précis de ce cours varie selon les années.

FREN 5700 [0.5 credit]

#### **Problématiques littéraires**

Le contenu précis de ce cours varie selon les années. Also offered at the undergraduate level, with different requirements, as FREN 4215, for which additional credit is precluded when topics are the same.

FREN 5800 [0.5 credit]

#### **Cours de lectures dirigées**

Sujet établi sur proposition de l'étudiant en consultation avec son conseiller.

FREN 5907 [1.0 credit]

#### **Comprehensive Examination**

FREN 5908 [1.0 credit]

#### **Mémoire de recherche**

FREN 5909 [2.0 credits]

#### **M.A. Thesis**



## Geography (GEOG)

### Department of Geography and Environmental Studies

GEOG 5000 [0.5 credit]

#### Approaches to Geographical Inquiry

A review of the major philosophical perspectives shaping research and explanation by geographers. Particular attention is paid to interpretations of social structure and human action, the nature of the biophysical universe, and the interaction between human beings and their environments.

GEOG 5001 [0.5 credit]

#### Modeling Environmental Systems

Methods and problems of research on the physical environment, with illustrative material taken from the atmospheric and surface earth sciences. Issues such as the identification and behaviour of environmental systems, temporal and spatial scale, experimental method under field conditions, and simulation and model development are considered.

GEOG 5003 [0.5 credit]

#### Practicing Human Geography

Development of critical research skills in qualitative geographical research by considering the relationship between theory and method. Emphasis on practical experience in selected methods including: interviewing, personal narratives, focus groups, participant observation, archival research, visual methodologies and participatory research. (Also listed as HCIN 5402.)

GEOG 5005 [0.5 credit]

#### Global Environmental Change: Human Implications

Global environmental change: its significance for societies, economies and international relations. Value systems underlying environmental discourse; political economy of the environment; sustainability and security. Environmental diplomacy and grassroots environmentalism. Regionalized impacts of pressures on natural environments; challenges of adaptation. (Also listed as INAF 5701.)

GEOG 5006 [0.5 credit]

#### Special Topics in Geography of the Environment

Research seminar on a selected theme within geographical approaches to environmental analysis. Topics will vary from year to year. Consult departmental web site for current details.

GEOG 5103 [0.5 credit]

#### Hydrologic Principles and Methods

Advanced physical hydrology with emphasis on atmospheric moisture, precipitation, evaporation, infiltration, soil water physics, snow hydrology and runoff generation. Analytical approaches and methods to solve practical hydrological problems.

GEOG 5104 [0.5 credit]

#### Advanced Biogeography

Current methods and theories in paleoecology are examined: dendrochronology, paleolimnology and other techniques for examining past climates and environmental condition. Numerical approaches to climate change studies.

GEOG 5107 [0.5 credit]

#### Field Study and Methodological Research

Field acquisition and analysis of geographic material; supervised field observations and methodology. (Individual or group basis, by special arrangement.)

GEOG 5201 [0.5 credit]

#### Special Topics in the Geography of Development

Research seminar within geographical approaches to development focusing on a selected theme or region. Topics vary from year to year. Consult departmental web site for current details.

GEOG 5303 [0.5 credit]

#### Geocryology

Development of ground ice in permafrost regions of Canada; ice segregation and pore-water expulsion during ground freezing; analytical and numerical approaches to modeling permafrost conditions. Prerequisite: GEOG 4108 or permission of the Department.

GEOG 5307 [0.5 credit]

#### Soil Resources

Physical, mineralogical, chemical, and other properties of soils will be studied in agricultural, environmental, geomorphological and/or geotechnical contexts, as relevant to the students enrolled.

GEOG 5400 [0.5 credit]

#### Territory and Territoriality

Contemporary geographical and international relations theorizing is challenging notions of boundaries and territories in the political organization of modernity. Using contemporary writings on geopolitics, security, sovereignty, self-determination and identity politics this course investigates territoriality as a political and intellectual strategy. (Also listed as INAF 5402.)

GEOG 5406 [0.5 credit]

#### Special Topics in Cultural Geography

Research seminar on a selected theme within cultural (including historical) geography. Topic varies from year to year. Consult departmental web site for current details.

GEOG 5500 [0.5 credit]

#### Globalization and Localities

A review of recent theoretical and methodological debate in this field and analysis of the changing geography of production, employment, and social consumption in advanced economies. Policy issues will be considered.

GEOG 5502 [0.5 credit]

#### Special Topics in Geography of Globalization

Research seminar on a selected theme within geographical aspects of globalization. Topic varies from year to year. Consult departmental web site for current details.

GEOG 5700 [0.5 credit]

#### Sustainability and Development in the Circumpolar North

The Circumpolar Arctic Region is undergoing rapid political, economic, social and technological development, which impacts sustainability. Climate, contaminants and biological diversity focus international attention, Nunavut, the Russian North, major developments, and international circumpolar regime formation; emphasis on environment and development.

GEOG 5800 [0.5 credit]

#### Spatial Information Systems

Advanced concepts and problems involving spatial information systems. Topics may include: data access and implementation issues; integration of GIS and environmental models, and managing uncertainty; spatial decision support systems; visualization; quantitative spatial analysis. Prerequisite: experience with GIS and permission of the department.

Graduate Courses - Geography (GEOG)

GEOG 5803 [0.5 credit]

**Remote Sensing and Image Analysis**

Topics may include: advanced sensors and calibration; radiometric data correction; spatial and temporal image analysis; non-parametric and object-based classification; spectral unmixing; scaling; physical-optical modeling; data fusion; selected applications in vegetation, urban, water, and geologic mapping.

GEOG 5804 [0.5 credit]

**Geographic Information Systems**

GIS for students with no previous experience. Includes data formats and structures, input/output and analysis capabilities, and GIS applications.

GEOG 5900 [0.5 credit]

**Graduate Tutorial**

Tutorial, directed reading or research, offered on an individual basis, to meet specific program needs; may be taken in one of the areas of specialization of the Department.

GEOG 5905 [0.5 credit]

**Masters Research Workshop**

A workshop which focuses on the challenges of research design in the various sub-fields of geography. The workshop will culminate with the development and defence of a thesis research proposal.

GEOG 5906 [2.5 credits]

**M.Sc. Thesis**

Thesis supervision will be given in Physical Geography, as listed in the introductory section of this department's program description.

GEOG 5909 [2.5 credits]

**M.A. Thesis**

Thesis supervision will be given in all areas of specialization of the Department, as listed in the introductory section of this department's program description.

GEOG 6000 [0.5 credit]

**Doctoral Core Seminar: Geography, Society and the Environment**

Geographical perspectives on the development of society/environment interrelations in Western thought and critiques thereof. The course is designed to represent and address integrative issues in the two fields of the program, the geography of social change and the geography of environmental change.

GEOG 6001 [0.5 credit]

**Doctoral Core Seminar: Geography, Society and the Environment**

Geographical perspectives on the development of society/environment interrelations in Western thought and critiques thereof. The course is designed to represent and address integrative issues in the two fields of the program, the geography of social change and the geography of environmental change.

GEOG 6003 [0.5 credit]

**Field Seminar: Geography of Societal Change**

Analysis of current geographical and related research into the three themes of global political economy: restructuring and the environment; geographies of socio-cultural evaluation; and feminist geographies.

GEOG 6004 [0.5 credit]

**Field Seminar: Geography of Societal Change**

Analysis of current geographical and related research into the three themes of global political economy: restructuring and the environment; geographies of socio-cultural evaluation; and feminist geographies.

GEOG 6006 [0.5 credit]

**Field Seminar: Geography of Environmental Change**

Analysis of geographical and related research into the appraisal and societal management of environmental resources, and environmental processes and anthropogenic impacts.

GEOG 6007 [0.5 credit]

**Field Seminar: Geography of Environmental Change**

Analysis of geographical and related research into the appraisal and societal management of environmental resources, and environmental processes and anthropogenic impacts.

GEOG 6906 [0.0 credit]

**Comprehensive Examination: The Geography of Societal Change**

This examination focuses on research challenges in theory and methodology in the themes of global political economy: restructuring and the environment; geographies of socio-cultural evaluation; feminist geographies. A specific theme will be identified for each candidate.

GEOG 6907 [0.0 credit]

**Comprehensive Examination: The Geography of Environmental Change**

This examination focuses on research challenges in theory and methodology associated with the appraisal and societal management of environmental resources, and environmental processes and anthropogenic impacts. A specific theme will be identified for each candidate.

GEOG 6909 [8.0 credits]

**Ph.D. Thesis**

## History (HIST)

### Department of History

HIST 5002 [0.5 credit]

#### Historical Practice

Topic selection, thesis and research essay proposals, and practical skills development.

Precludes additional credit for HIST 5000, HIST 5001[1.0] (no longer offered).

HIST 5003 [0.5 credit]

#### Historical Theory and Method

An examination of the meaning and use of historical theory.

Precludes additional credit for HIST 5000, HIST 5001 [1.0] (no longer offered).

HIST 5006 [1.0 credit]

#### Seminar in Medieval History

Selected problems relating to medieval history. The themes and historical period will be specified each year.

HIST 5008 [0.5 credit]

#### The Early Modern World

An overview of the history of the early modern world.

HIST 5009 [0.5 credit]

#### Seminar in Early Modern History

A selected topic in the history of the early modern world.

HIST 5100 [1.0 credit]

#### Seminar in Early Modern European History

A selected problem in the history of Europe during the early modern period. Also offered at the undergraduate level with different requirements, as HIST 4100, for which additional credit is precluded.

HIST 5200 [1.0 credit]

#### Seminar in European History

A selected problem or period in the history of Europe. Also offered at the undergraduate level with different requirements, as HIST 4200, for which additional credit is precluded.

HIST 5310 [1.0 credit]

#### Canada: Culture and Ideas

A seminar in the history of Canadian culture and ideas. The themes and historical period will be specified each year.

HIST 5311 [1.0 credit]

#### Canada: Politics and Diplomacy

A seminar in the history of Canadian politics and diplomacy. The themes and historical period will be specified each year.

HIST 5312 [1.0 credit]

#### Canadian Social History

A seminar in Canadian social history. The themes and historical period will be specified each year.

HIST 5313 [1.0 credit]

#### Canadian Regional History

A seminar in Canadian regional history. The themes and historical period will be specified each year.

HIST 5400 [1.0 credit]

#### Seminar in American History

Research seminar in American history. The themes and historical period will be specified each year.

HIST 5508 [1.0 credit]

#### Seminar in British History

Selected problems relating to the history of Britain in the early modern or modern period. The themes and historical period will be specified each year.

HIST 5509 [1.0 credit]

#### Seminar on Women and Gender

Selected problems relating to the history of women and gender. The themes and historical period will be specified each year.

HIST 5600 [1.0 credit]

#### Seminar in Russian History

An examination of primary sources available for research on revolutionary Russia, 1898-1921. A sound reading knowledge of Russian is required for admission.

HIST 5603 [0.5 credit]

#### Imperial and Soviet Russia

Legacies of the tsarist empire and the Soviet Union that influence the region today. Topics discussed include political culture, empire, socialism, class, gender, and non-Russian peoples. Also offered at the undergraduate level with different requirements, as HIST 4603, for which additional credit is precluded. Also listed as EURR 5203.

HIST 5604 [0.5 credit]

#### Central Europe, Past and Present

Evolution and current status of Central Europe, from periods of foreign control in the late nineteenth and twentieth centuries to independent statehood. Emphasis on national accommodations and conflicts. Also offered at the undergraduate level with different requirements as, HIST 4604, for which additional credit is precluded. Also listed as EURR 5204.

HIST 5700 [0.5 credit]

#### Introduction to Public History

Introduction to critical thinking about history's place in the public sphere, including history and popular culture, exhibiting history, the politics of the past, historical presentation and impact of digitization and other new information technologies, through lectures, readings, and field trips.

HIST 5701 [0.5 credit]

#### Archival Theory and Practice

Theories, methodologies and problems relating to archives and records management such as archival responses to the challenges of managing and preserving electronic records; principles and concepts guiding the work of archivists; records appraisal, collection, arrangement, description.

HIST 5702 [0.5 credit]

#### Public History Special Topics

Theoretical and practical instruction in topical areas such as 'history and new media,' 'oral history,' 'museums and national memory,' 'community history,' 'visual media,' 'material history,' etc.

HIST 5704 [0.0 credit]

#### Internship in Public History

Placement for a term, normally over the summer following the first year of study, to put into practice the precepts learned in course work. Students will be jointly supervised by their employers and a faculty member. A written report on work will be required from the student and an assessment from the employer.

HIST 5708 [1.0 credit]

**Seminar in World History**

A selected problem or period in the history of Asia-Oceania, Africa, or Latin America. Also offered at the undergraduate level, with different requirements, as HIST 4700, for which additional credit is precluded.

HIST 5800 [1.0 credit]

**International History**

A seminar in international history; the themes and historical period will be specified each year.

HIST 5802 [1.0 credit]

**Selected Topics: Transnational or Thematic**

A seminar on a transnational or thematic topic. The particular topic will be specified each year

HIST 5803 [0.5 credit]

**History of Women, Gender and Sexuality: Foundations**

Selected problems in the historiography of women, gender and sexuality. Precludes additional credit for HIST 5807 (no longer offered).

HIST 5804 [0.5 credit]

**Problems in the History of Women, Gender and Sexuality**

Selected problems in the historiography of women, gender and sexuality, focusing on a topic to be announced annually. Precludes additional credit for HIST 5807 (no longer offered).

HIST 5805 [0.5 credit]

**Historiography of Canada I**

A seminar primarily for graduate students in Canadian history, which examines the trends and methods of Canadian historical writing and the influences upon it. Precludes additional credit for HIST 5808 (no longer offered).

HIST 5806 [0.5 credit]

**Historiography of Canada II**

A seminar primarily for graduate students in Canadian history, which examines the trends and methods of Canadian historical writing and the influences upon it. Precludes additional credit for HIST 5808 (no longer offered).

HIST 5809 [1.0 credit]

**Historiography: Directed Studies**

Selected problems in the historiography of a geographical or thematic area not covered by a scheduled course.

HIST 5810 [0.5 credit]

**Medieval and Early Modern European Historiography**

An introduction to trends and methods in the writing of medieval and early modern European history, exploring the major schools of historical scholarship and thought through the study of selected problems.

HIST 5811 [0.5 credit]

**Modern European Historiography**

Trends and methods in the writing of modern European history, exploring the major schools of historical scholarship and thought through the study of selected problems.

HIST 5812 [0.5 credit]

**Non-Western Historiography**

Selected problems in the historiography of geographical and thematic areas of the Non-Western world. An introduction to trends and methods in Non-Western history exploring the major schools of historical scholarship and thought through the study of selected problems.

HIST 5813 [0.5 credit]

**Historiography of the United States**

An introduction to trends and methods in the writing of the history of the United States, exploring the major schools of historical scholarship and thought through the study of selected problems.

HIST 5901 [1.0 credit]

**Directed Studies - Canadian**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

HIST 5900 [0.5 credit]

**Directed Research**

A course designed for students and supervisors to confer regularly in preparation for the research essay. Graded satisfactory/unsatisfactory upon a written report from the supervisor. Prerequisite: open only to students enrolled in the Research Essay option of the regular M.A.

HIST 5902 [1.0 credit]

**Directed Studies - Non-Canadian**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

HIST 5903 [0.5 credit]

**Directed Studies - Canadian**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

HIST 5904 [0.5 credit]

**Directed Studies - Non-Canadian**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar.

HIST 5905 [0.5 credit]

**Selected Topics - Canadian Field**

A seminar in an area not covered by an existing graduate course.

HIST 5906 [0.5 credit]

**Selected Topics - Non-Canadian Field**

A seminar in an area not covered by an existing graduate course.

HIST 5908 [1.0 credit]

**M.A. Research Essay**

An examination of an approved topic in an area of departmental specialization or in an appropriate area of Public History.

HIST 5909 [2.0 credits]

**M.A. Thesis**

A substantial historical investigation. The subject will be determined in consultation with the Department, and a supervisor will be assigned. The candidate will be examined orally after presenting his/her thesis.

HIST 6100 [1.0 credit]

**Modern Europe Minor**

A program of supervised reading in modern European history leading to a minor field examination. Offered in the winter and summer terms.

HIST 6200 [1.0 credit]

**Early Modern Europe Minor**

A program of supervised reading in early modern European history leading to a minor field examination. Offered in the fall and winter terms.



HIST 6400 [1.0 credit]

**Directed Studies - United States**

Supervised reading in American history leading to a minor field examination.

HIST 6500 [1.0 credit]

**Directed Studies - British**

Supervised reading in British history leading to a minor field examination.

HIST 6600 [1.0 credit]

**Directed Studies - Transnational or Thematic**

Supervised reading in a transnational or thematic topic leading to a minor field examination.

HIST 6701 [0.5 credit]

**Directed Studies - History and Political Economy**

A program of supervised readings in political economy and history. When taken in conjunction with PECO 6000, will be considered as the second minor field of the student.

HIST 6808 [1.0 credit]

**Historical Theory and Method**

A course primarily for doctoral candidates in history, offered in alternate years, in which trends in historical theory and methodology will be examined.

HIST 6901 [1.0 credit]

**Canadian History Minor**

A program of supervised reading in Canadian history leading to a minor field examination.

HIST 6903 [1.0 credit]

**Women, Gender, Sexuality Minor**

A program of supervised reading in History of Women, Gender and Sexuality leading to a minor field examination.

HIST 6906 [0.5 credit]

**Ph.D. Tutorials**

A program of supervised reading in preparation for the Ph.D. oral examination in the student's major field. Students must enrol in the appropriate course section and complete three terms (fall, winter, summer) of this course before sitting the oral comprehensive examination.

Precludes additional credit for HIST 6904 and HIST 6905 (no longer offered).

HIST 6907 [0.5 credit]

**Ph.D. Comprehensive**

Ph.D. oral comprehensive examination in the major field. The exam is undertaken in the student's fourth term.

Precludes additional credit for HIST 6900 and HIST 6902 (no longer offered).

HIST 6909 [5.0 credits]

**Ph.D. Thesis**

## Human-Computer Interaction (HCIN)

### Carleton School of Information Technology

HCIN 5100 [0.5 credit]

#### **Fundamentals of HCI Design and Evaluation**

A survey of strategies and practices in HCI design and evaluation. Students will learn to perform studies in user interface analysis and design, to read the research literature critically, distill important points from readings, summarize, and write papers as well as design user interfaces and present their written and oral work. Also offered as PSYC 5105.

HCIN 5200 [0.5 credit]

#### **Software and User Interface Development**

Design and development of user interfaces for software systems based on principles for supporting user interaction, with emphasis on frameworks, tools, and processes for user interface development.

HCIN 5300 [0.5 credit]

#### **Interactive Entertainment Technologies**

Introduction to the elements related to interactivity in entertainment technologies. A range of topics important in the entertainment industry (film, video games, ubiquitous computing) are examined, and the foundations behind these are explained to understand the significant role of the user interface.

HCIN 5401 [0.5 credit]

#### **Experimental Research in Cognition**

An introduction to the contribution of experimental psychology and neuroscience to cognitive science. Also offered as CGSC 5002.

HCIN 5402 [0.5 credit]

#### **Practising Human Geography**

Development of critical research skills in qualitative geographical research by considering the relationship between theory and method. Emphasis on practical experience in selected methods including interviewing, personal narratives, focus groups, participant observation, archival research, visual methodologies and participatory research. Also offered as GEOG 5003.

HCIN 5403 [0.5 credit]

#### **Research methods in HCI**

An introduction to quantitative and qualitative research methods in HCI. Students will acquire skills in collecting and analyzing HCI data, presenting the findings and specifying practical implications. Also offered as PSYC 5106.

HCIN 5404 [0.5 credit]

#### **Design Research Methods**

Critical analysis of research methods in design and disciplines contributing to design including anthropology, psychology, sociology, and business. Application areas include advanced materials and manufacturing processes, advanced visualization, product interaction design, extreme environments, sustainable design, design and culture, design management, and human-oriented design. Also offered as IDES 5102.

HCIN 5405 [0.5 credit]

#### **Methodologies for Discrete-Event Modelling and Simulation**

Methodological aspects of simulation. Modelling discrete events systems. Modeling formalisms: FSA, FSM, Petri Nets, DEVS, others. Verification and Verification. Cellular models: Cellular Automata, Cell-DEVS. Continuous and hybrid models. Parallel and Distributed simulation (PADS) techniques. PADS middleware: HLA, Parallel-DEVS, Time-Warp. Also offered as SYCS 5104.

HCIN 5406 [0.5 credit]

#### **Object-Oriented Software Development**

Issues in modeling and verifying quality and variability in object-oriented systems. Testable models in model-driven and test-driven approaches. System family engineering. Functional conformance: scenario modeling and verification, design by contract. Conformance to non functional requirements: goals, forces and tradeoffs, metrics. Also offered as COMP 5104.

HCIN 5909 [2.0 credits]

#### **Thesis in Human-Computer Interaction**

## Industrial Design (IDES)

### School of Industrial Design

IDES 5000 [0.5 credit]

**Directed Studies in Industrial Design**  
Reading and research tutorials.

IDES 5101 [0.5 credit]

#### **Interdisciplinary Design Development Seminar**

Investigation of disciplines involved in design development, with experts in business, engineering, sociology/anthropology, architecture, psychology, human factors, industrial design, and others. Critical examination of methods used to integrate different approaches, and roles that personality, leadership, negotiation, conflict management, and teambuilding play in collaboration.

IDES 5102 [0.5 credit]

#### **Research Methods**

Critical analysis of research methods in design and disciplines contributing to design including anthropology, psychology, sociology, and business. Application areas include advanced materials and manufacturing processes, advanced visualization, product interaction design, extreme environments, sustainable design, design and culture, design management, and human-oriented design.

IDES 5103 [0.5 credit]

#### **Interdisciplinary Design Development Studio**

Team-based studio projects draw on interdisciplinary design development methods in achieving a common design objective. Projects will be supervised by academic and industry advisors from a wide range of disciplines, and conducted in collaboration with professionals from external organizations. Open to students from other programs.

Prerequisites: IDES 5101 and IDES 5102 or permission of the School of Industrial Design.

IDES 5201 [0.5 credit]

#### **Thesis Proposal**

Investigation into a theoretically and practically relevant research problem. Students will analyze and synthesize findings involving interdisciplinary design development processes and develop these into a thesis proposal. This is a directed study with specific content, objectives, and scheduling arranged between student and academic advisors.

Prerequisites: IDES 5101, IDES 5102, and IDES 5103.

IDES 5500 [0.5 credit]

#### **Special Topics in Industrial Design**

Seminar course in contemporary design issues of an interdisciplinary nature. Guided by a faculty member and supported by external professionals.

IDES 5909 [1.5 credits]

#### **Thesis**

A comprehensive project that demonstrates the student's ability to conduct critical research in a specific area in which design can contribute to competitive advantage through design planning and interdisciplinary design development processes.

Prerequisites: IDES 5101, IDES 5102, IDES 5103, and IDES 5201.

## Information and Systems Science (ISYS)

### Department of Systems and Computer Engineering

ISYS 5802 [0.5 credit]

#### **Introduction to Information and Systems Science**

An introduction to the process of applying computers in problem solving. Emphasis is placed on the design and analysis of efficient computer algorithms for large, complex problems. Applications in a number of areas are presented: data manipulation, databases, computer networks, queuing systems, optimization. (Also listed as MATH 5802, SYSC 5802, COMP 5802.)

ISYS 5908 [1.5 credits]

#### **M.Sc. Thesis in Information and Systems Science**

(Also listed as MATH 5908, SYSC 5908, COMP 5908.)

## Information Systems (ITIS)

### Sprott School of Business

ITIS 5401 [0.25 credit]

#### **Fundamentals of IT Service Management**

ITIL and ISO 20000 topics including service support and service delivery fundamentals. Service support includes service/help desk, configuration, incident, problem, release, and change management. Service delivery includes security, service level, capacity, continuity, availability and IT financial management. Precludes additional credit for IBUS 5701 and ITIS 5413.

ITIS 5403 [0.25 credit]

#### **ICT for Development**

Conceptual frameworks to understand the prospects and challenges and roles of information and of information and communications technologies (ICTs) in social and economic development; knowledge and skills to help in the effective planning, development, implementation and management of ICT for development initiatives; case studies

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

ITIS 5411 [0.25 credit]

#### **IT Service Support**

Management of IT processes crucial to business operations. IT service management (ITSM) best practices including service desk management, incident management, problem management, change management, release management, and configuration management.

Precludes additional credit for BUSI 5401.

ITIS 5412 [0.25 credit]

#### **IT Service Delivery**

Service level management, services reporting, service continuity and availability management, budgeting and accounting for IT services, capacity management and information security management. Service level agreements (SLAs) and information technology security techniques subjects.

Precludes additional credit for BUSI 5401.

ITIS 5413 [0.25 credit]

#### **Enterprise Architecture and Governance**

Exploration and analysis of enterprise architecture frameworks used to guide organizations in aligning business and IT strategies and goals while enhancing organizational efficiency in the adoption and use of IT. Models of IT Governance.

ITIS 5414 [0.25 credit]

#### **Emerging Information Technologies and Business Innovation**

Examines the emerging information technology trends and how new technologies can be incorporated to drive process innovation and improve operational performance.

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

ITIS 5421 [0.25 credit]

#### **Strategic Management of Technology Concentration Integration**

Components and aspects of technology strategy formulation and its successful implementation in an organization. Technology strategy from a general management perspective, designing and developing technology strategy for sustaining competitiveness. Project-based course. (Also listed as TOMS 5321.)

Prerequisite: successful completion of all courses in the Technology Management concentration.



## Infrastructure Protection and International Security (IPIS)

### Infrastructure Protection and International Security Committee

IPIS 5101 [0.5 credit]

#### Critical Infrastructure Protection: Issues and Strategies

Examines critical infrastructure, its interdependencies, vulnerabilities, and security requirements; intentional and natural risks; policy responses to threat and vulnerability assessments; risk management approaches, prevention and protective security, emergency management and damage mitigation measures; continuity of critical operations and resilience planning.

IPIS 5102 [0.5 credit]

#### Introduction to Infrastructure Management

Infrastructure management and its relationship to facility and asset management; challenges facing infrastructure managers; tools for effective IM; concept of total quality management; economic analysis of maintenance, rehabilitation and reconstruction; use of life cycle cost analysis in decision making, development and use of IM systems. Precludes additional credit for CIVE 5809 (2005-2007).

IPIS 5103 [0.5 credit]

#### Infrastructure Engineering Principles

Introduction to infrastructure engineering: civil, municipal/environmental, energy, communications, and military infrastructure systems; engineering principles; design, analysis and construction techniques; lifecycle performance, maintenance and retrofit strategies; optimization, asset-management; decision-making and decision support tools.

IPIS 5104 [0.5 credit]

#### Terrorism and International Security

Contemporary international terrorism in comparative perspective; religious and ideological parameters motivating terrorism; sociology of recruitment and participation; evolving structure and dynamics of terror networks; terrorism finance, operations and related activities; impact of counter-terrorism measures; examples are drawn from international and domestic terrorism. (Also listed as INAF 5244.)

IPIS 5301 [0.5 credit]

#### Disarmament, Arms Control and Nonproliferation

Origins, theory and practice, with a focus on so-called weapons of mass destruction and current controversies. Emphasis on treaty negotiation and implementation, including monitoring, verification, facilitation and enforcement of compliance. (Also listed as INAF 5201.)

IPIS 5302 [0.5 credit]

#### International Security after the Cold War

The evolving strategic and security environment since the end of the Cold War, encompassing both traditional and non-traditional concepts. Topics include hegemonism; the rise of new powers; terrorism; multilateralism; human security; and new security threats, including climate change. (Also listed as INAF 5202.)

IPIS 5303 [0.5 credit]

#### Intelligence Statecraft and International Affairs

The role of intelligence in foreign and security policy after the Cold War. Evolution of intelligence as regards strategic and policy requirements, the capabilities of selected services, interactions within government and civil society. Emphasis on the structure and functions of Canada's intelligence community. (Also listed as INAF 5204.)

IPIS 5304 [0.5 credit]

#### Intelligence and National Security: Policies and Operations

The roles and activities of intelligence services of selected countries. Their performance will be assessed in the light of historical experience, and in the context of the policy, legal and ethical constraints. (Also listed as INAF 5224.)

IPIS 5305 [0.5 credit]

#### National Security Policy and Law

The international legal and policy implications of identifying and responding to national security threats. Topics include: intelligence gathering; verification regimes; military and counter-terrorism operations; criminal prosecution; and, balancing human rights and security concerns. (Also listed as INAF 5234.)

IPIS 5320 [0.5 credit]

#### Topics in Infrastructure Security

Courses in special topics related to infrastructure security, not covered by other graduate courses; course topics will be available prior to registration.

IPIS 5501 [0.5 credit]

#### Transportation and Aviation Security

Canadian Public Security Strategy and Transportation System security environment; Civil Aviation security and operations: trends, impacts, and implications of evolving policies, operations, and technologies; security vulnerabilities in the transportation system; transportation of hazardous materials; secure movements on roads, highways and railways.

IPIS 5502 [0.5 credit]

#### Infrastructure Assets Management

Municipal infrastructure systems: portable water systems, waste and storm water collection and treatment, roads, sidewalks, bridges and overpasses; decision-making in municipal environment; elements of asset management systems: inventory, diagnostic and condition assessment, performance and prediction, valuation, planning and lifecycle analysis; prioritization of interventions. Precludes additional credit for CIVE5706 (2005-2007).

IPIS 5503 [0.5 credit]

#### People in Fires

Review of the work presented by the founders in the field of human behaviour in fire. Introduction to the basic notions of perception, cognition, information processing, decision-making and problem solving. Behavioural concepts such as panic, commitment, affiliation, familiarity and role are discussed. Precludes additional credit for CIVE 5708 (2001-2003), CIVE 5611.

IPIS 5504 [0.5 credit]

#### Fundamentals of Fire Safety

The fire safety system; social, economic and environmental issues; description of the fire safety regulatory system and the governing building codes and standards. This includes the global fire safety system in a facility and active fire protection systems; detection, suppression, smoke management. Precludes additional credit for CIVE 5707 (2001-2003), CIVE 5609.

IPIS 5505 [0.5 credit]

#### Geohazards

Earthquakes and ground motion, tsunamis, landslides, liquefaction; soil properties for ground response analysis: laboratory tests, in-situ tests; dams and embankments, slope stability, seismic effects on slope stability, retaining structures.

IPIS 5506 [0.5 credit]

**Public Health Safety**

Public health protection: environmental, political, and societal issues; microbes in water, food, and air; toxic chemicals and heavy metals; detection, and fate of chemicals and pathogens in the environment; epidemiology; toxicology; risk assessment; water supply and treatment.

IPIS 5507 [0.5 credit]

**Blast-load Effects on Structures**

Threats, risk analysis, vulnerability assessment; explosives: types and mechanisms; load determination; response of structural elements under blast loads, analysis and design for blast loads; blast mitigation, retrofit of structures; post-event assessment.

Precludes additional credit for CIVE 5707 (2007-2008).

IPIS 5520 [0.5 credit]

**Selected Topics in Engineering of Critical Infrastructure**

Courses in special topics related to infrastructure security, not covered by other graduate courses; course topics will be available prior to registration.

IPIS 5907 [1.0 credit]

**Infrastructure Engineering Project**

Students enrolled in the project option will conduct a study, analysis, or design project that relates to the protection and security of infrastructure under the general supervision of a member of the department.

IPIS 5908 [1.0 credit]

**Research Essay**

Under the general guidance of a research supervisor, students enrolled in the research essay option will conduct independent research on a relevant topic that integrates the infrastructure, engineering and security elements of their program of study.

## International Affairs (INAF)

### Norman Paterson School of International Affairs

INAF 5001 [0.5 credit]

#### Policy and Methods for International Affairs

Policy formulation and research methods in an international context. The policy component reviews key theories of policy formulation and their relationship to applied policy analysis and evaluation. The methods component examines the principles of social sciences research, basic research design, and techniques of analysis.

Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the School of International Affairs.

INAF 5002 [0.5 credit]

#### Issues in International Development

International political, social and economic aspects of development. Approaches to trade policies, finance, regional integration, technology transfer and transnational enterprises, global governance, international civil society and development, the environment and natural resources, and social and labour issues in the international context.

(Also offered as IDMG 5602.)

Precludes additional credit for INAF 5004 (taken prior to 2001).

INAF 5003 [0.5 credit]

#### Project Operations in a Developing Country Context

Theoretical foundations and central policy issues. Practical aspects of project operations and management in a developing country, with an emphasis on development projects from inception and negotiation, through financing and operational control, to monitoring and evaluation. (Also offered as IDMG 5603).

INAF 5006 [0.5 credit]

#### Agriculture and Rural Development

A study of the agricultural sector, rural areas, and rural welfare in developing countries, including structural change in agriculture, agrarian reform, rural development strategies in various countries, and public policies affecting agriculture, activities ancillary to agriculture, rural industry, and public service.

(Also offered as IDMG 5606.)

INAF 5007 [0.5 credit]

#### Theories of Development and Underdevelopment

A comparative analysis of approaches to the study of development processes and underdevelopment, including structural-functional, neo-classical, Marxist, and dependency theories.

Prerequisite: enrolment in the Development Administration stream of the M.A. program in the School of Public Policy and Administration, or permission of the School of International Affairs.

INAF 5008 [0.5 credit]

#### Economic Development Policy and Planning

Developing country policies and planning and their impacts, including macro and sectoral techniques employed in development planning, budgeting, and problems in development administration.

Prerequisite: enrolment in the Development Administration stream of the M.A. program in the School of Public Policy and Administration, or permission of the School of International Affairs.

INAF 5009 [0.5 credit]

#### International Aspects of Economic Development

Economic theory and policy dimensions of key issues in international economic development. Topics include: trade theory and policy for developing countries; debt, adjustment and macroeconomic stabilization; the role of international financial institutions; financial flows and the role of multinational corporations.

(Also offered as IDMG 5609.)

Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the School.

INAF 5100 [0.5 credit]

#### Canada in International Affairs

Canada's role in international affairs; issues of conflict and conflict resolution, international political economy, and international development. Analysis of the content and formulation of Canada's international policies.

INAF 5101 [0.5 credit]

#### The Politics and Institutions of International Trade

Canadian trade practice; trade policy within the broader context of Canadian policy-making, comparison of Canadian policy and practice with that in the United States, Europe, Japan, and the major developing countries.

Precludes additional credit for INAF 5409 (taken prior to 1997-98).

INAF 5102 [0.5 credit]

#### Canada-U.S. Relations

The relationship between Canada and the United States from political, economic, diplomatic, military, and cultural perspectives. The history of Canada's relations with the United States, as our neighbor, trading partner, ally, and sometime antagonist.

Precludes additional credit for INAF 5409, if taken 2003/04, 2004/05.

INAF 5108 [0.5 credit]

#### Conflict Analysis

Sources of international and intrastate conflict. Students will gain practical insight and understanding of the causes of conflict by drawing on frameworks from a number of social sciences disciplines, with a focus on diagnostic and analytical skills in the decision making process.

Precludes additional credit for INAF 5105 (taken prior to 2001).

INAF 5109 [0.5 credit]

#### Conflict Management: Theory and Evidence

Evaluation of conflict management theory and practice in regional, interstate and intrastate conflict. Analyse the various dimensions of conflict management - including prevention, mitigation, and containment, as well as military engagement - and assess the efficacy of these approaches in contemporary case studies.

INAF 5200 [0.5 credit]

#### Peacebuilding and Reconstruction: Theory and Practice

Social, economic and military dimensions of post-conflict reconstruction with special attention to the role of local and international government and non-government organizations in the peacebuilding process. Evidence is drawn from recent cases.

INAF 5201 [0.5 credit]

#### Disarmament, Arms Control and Nonproliferation

Origins, theory and practice, with a focus on so-called weapons of mass destruction and current controversies. Emphasis on treaty negotiation and implementation, including monitoring, verification, facilitation and enforcement of compliance. (Also listed as IPIS 5301.)

INAF 5202 [0.5 credit]

**International Security After the Cold War**

The evolving strategic and security environment since the end of the Cold War, encompassing both traditional and non-traditional concepts. Topics include hegemonism; the rise of new powers; terrorism; multilateralism; human security; and new security threats, including climate change. (Also listed as IPIS 5302.)

INAF 5203 [0.5 credit]

**International Mediation and Conflict Resolution**

Exploration of various approaches to the prevention, management and resolution of international conflict including peacekeeping, preventive diplomacy, mediation and peacebuilding, as well as less formal mechanisms for third party collaborative problem solving.

INAF 5204 [0.5 credit]

**Intelligence, Statecraft and International Affairs**

The role of intelligence in foreign and security policy after the Cold War. Evolution of intelligence as regards strategic and policy requirements, the capabilities of selected services, interactions within government and civil society. Emphasis on the structure and functions of Canada's intelligence community. (Also listed as IPIS 5303.)

INAF 5205 [0.5 credit]

**Economics of Conflict**

The economic dimensions of conflict and the application of economic methods to understanding conflict and conflict management. Precludes additional credit for INAF 5409 [formerly 46.549R] (taken in 2002-03).

INAF 5206 [0.5 credit]

**Civil-Military Relations**

Theoretical and practical issues of civil-military relations; analysis of the multidisciplinary and multidimensional nature of the relationship between society, political authority and the military, using comparative and global frames of reference. Precludes additional credit for INAF 5409 sections R and S (taken 2002/03, 03/04).

INAF 5207 [0.5 credit]

**Middle East Economic and Political Relations**

Economic and political relations among countries of the Middle East; emphasis on the peace process and arrangements for regional security and regional economic cooperation; prospects for regional collaboration.

INAF 5208 [0.5 credit]

**U.S. Foreign and Security Policy**

Causes and consequences of U.S. foreign and security policy. Explanation and evaluation of past and present U.S. policies. Cases will be drawn from 20th century wars, interventions and crises; post-Cold War and post 9-11 U.S. policies. Precludes additional credit for INAF 5409 section 'X' (taken 2001/02, 02/03).

INAF 5209 [0.5 credit]

**Conflict and Development**

Examination of competing interpretations of conflict in developing countries; material conditions, institutional factors, and ideological, or identity-based framing processes. The impact of war on development, and implications for policy. (Also offered as IDMG 5601.)

INAF 5214 [0.5 credit]

**Economics for Defence and Security**

Examines the economic analysis of defence and security, applying economic analysis to topics such as defence production, procurement, offence and defence balance, alliance theory, deterrence, arms races, terrorism and terrorist financing.

INAF 5219 [0.5 credit]

**Rights, Development, and Conflict**

Uses economic institutionalism to examine the intersection of development and conflict, focusing on how the connection between property rights and development affects conflict. Topics include gender, land conflict, urban peripheries, migration and refugees, domestic and transnational crime, and state violence. (Also offered as IDMG 5619.)

INAF 5224 [0.5 credit]

**Intelligence and National Security: Policies and Operations**

The roles and activities of intelligence services of selected countries. Their performance will be assessed in the light of historical experience, and in the context of the policy, legal and ethical constraints. (Also listed as IPIS 5304.)

INAF 5234 [0.5 credit]

**National Security Policy and Law**

The international legal and policy implications of identifying and responding to national security threats. Topics include: intelligence gathering; verification regimes; military and counter-terrorism operations; criminal prosecution; and, balancing human rights and security concerns. (Also listed as IPIS 5305.)

INAF 5244 [0.5 credit]

**Terrorism and International Security**

Contemporary international terrorism in comparative perspective, including religious and ideological motivations, sociology of recruitment and participation, evolving structures and dynamics of terror networks, financing and operations, and counter-terrorism measures. Examples are drawn from international and domestic terrorism. (Also listed as IPIS 5104.) Precludes additional credit for INAF 5409W in Winter 2008.

INAF 5300 [0.5 credit]

**Political Economy of Multinational Enterprises**

Recent economic and political developments in the fields of international economics and industrial organization as they affect multinational enterprises. The course develops concepts and analytical approaches to examine the impact of multinational enterprises on international affairs and the implications for public policy.

INAF 5303 [0.5 credit]

**Science, Technology and International Affairs: The Third World**

The problem of building indigenous technological capabilities in the Third World. The role of MNCs in the transfer of technology, the generation of appropriate technologies locally and the role of the state in the formulation of technology policy for development.

INAF 5305 [0.5 credit]

**International Bargaining and Negotiation: Theory and Practice**

An examination of bargaining and negotiation in international economic, political, and security issue areas, using case studies and theoretical analysis.



INAF 5306 [0.5 credit]

**Trade Policy in North America**

Canadian, American and Mexican trade and trade policy from colonial times to present, emphasizing the development of trade relations and the negotiation and operation of bilateral, regional (NAFTA), and multilateral trade agreements.

Precludes additional credit for INAF 5409, section 'F' (taken in 2005/06).

INAF 5307 [0.5 credit]

**Macroeconomics in a Development Context**

Macroeconomic theory and policy in the context of the developing countries, with special emphasis upon theory and policy for open economies, structural adjustment to international disequilibrium, exchange rate and balance of payments management, fiscal and financial policy.

Prerequisite: enrolment in the Development Administration stream of the M.A. program of the School of Public Policy and Administration, or permission of the School of International Affairs.

INAF 5308 [0.5 credit]

**International Trade: Theory and Policy**

The pure theory of international trade and selected policy issues. Topics include theories of the pattern of trade, the gains from trade, the theory of distortions and welfare, and theories of endogenous trade policy formation.

Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the School.

INAF 5309 [0.5 credit]

**International Finance: Theory and Policy**

Theory and policy in open economy macroeconomics and international finance. Topics include: exchange rate and output determination, balance of payments adjustment, monetary and fiscal policy under different exchange rate regimes, and the structure and performance of the international monetary system.

Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the School.

INAF 5400 [0.5 credit]

**Trade Policy Analysis**

Selected trade and trade-related policy issues.

Topics are drawn from current policy debates, and may include: multilateral vs. preferential trade liberalization; standards harmonization as a precondition for free trade; and globalization and the rising skill wage premium.

Prerequisites: M.A. standing in the Norman Paterson School of International Affairs, or permission of the School of International Affairs.

INAF 5401 [0.5 credit]

**International Financial Institutions and Policy**

Institutional arrangements, international financial flows, and critical events in international finance; development and operation of international financial institutions, and how they have shaped modern financial markets, events, and policy.

Precludes additional credit for INAF 5409 (taken prior to 1997-98).

INAF 5402 [0.5 credit]

**Territory and Territoriality**

Contemporary geographical and international relations theorizing is challenging conventional notions of boundaries and territories in the political organization of modernity. Using contemporary writings on geopolitics, security, sovereignty, self-determination and identity politics, this course investigates territoriality as a political and intellectual strategy. (Also listed as GEOG 5400.)

INAF 5405 [0.5 credit]

**International Organizations in International Affairs**

A critical analysis of the roles played by the United Nations and other international organizations in the field of international conflict, development, and political economy.

INAF 5406 [0.5 credit]

**Advanced International Policy Analysis**

Examination of international public policies of a number of countries, including Canada; approaches to the policy process and case studies of the formulation and evaluation of economic, political, and security policies.

Precludes additional credit for INAF 6003.

Prerequisite: permission of the School.

INAF 5407 [0.5 credit]

**International Relations Theory**

Overview of theories of international relations. Organized both historically and conceptually, the course will examine a variety of theoretical approaches to international relations, among them the realist, liberal, structural, neo-realist, and critical perspectives.

INAF 5408 [0.5 credit]

**Gender in International Affairs**

The role of gender differences in international affairs gender in the social sciences and feminist theories regarding war, nationalism, human rights, development, and the global economy.

INAF 5409 [0.5 credit]

**Selected Topics in International Affairs**

INAF 5418 [0.5 credit]

**Gender and Human Security**

Explores the intersection of gender and human security. Themes include: gender-based violence and vulnerabilities in war; masculinity and the military; trafficking in women and children; forced and child marriages; gender and international refugees; gender and crime; gender-based international policies.

INAF 5419 [0.5 credit]

**Selected Topics in International Affairs**

INAF 5429 [0.5 credit]

**Selected Topics in International Affairs**

INAF 5439 [0.5 credit]

**Selected Topics in International Affairs**

INAF 5449 [0.5 credit]

**Selected Topics in International Affairs**

INAF 5459 [0.5 credit]

**Selected Topics in International Affairs**

INAF 5500 [0.5 credit]

**Comparative Trade Policy**

Examination of trade policies of various states, and their associated institutional arrangement. Countries and country groupings to be examined include the United States, Japan, the European Union, and key developing countries.

INAF 5501 [0.5 credit]

**Global Political Economy**

The interaction between states, interest groups, firms and markets, how the global nature of the world economy affects states, especially Canada, and the governance of economic issues at the international level including trade, investment, finance and development.

Precludes additional credit for INAF 5000 (taken prior to 2001).

INAF 5502 [0.5 credit]

**State Sovereignty and Globalization**

How increased political, social and economic integration internationally affects a government's ability to formulate policy; examination of domestic and international policy issues and whether and how global forces and their domestic counterparts shape the policy-making environment.

Precludes additional credit for INAF 5000 (taken prior to 2001).

INAF 5505 [0.5 credit]

**International Law: Theory and Practice**

Theoretical perspectives on international law and the role international law plays in the international system. Topics include basis, creation and sources of international law, international dispute resolution, and international law and world order transformation. (Also listed as LAWS 5603.)

INAF 5506 [0.5 credit]

**International Law: Use of Force**

How legal constraints govern the use of force in international relations. Topics include legal options available to states and the international community, the use of weapons of mass destruction, terrorism, peacekeeping, and humanitarian intervention.

Precludes additional credit for INAF 5409 (taken in 2003).

INAF 5507 [0.5 credit]

**International Economic Law: Regulation of Trade and Investment**

Study of regulation of international economic relations. International institutions, legal aspects of integration, governmental regulation of trade and investment. (Also listed as LAWS 5200.)

Prerequisite: open only to graduate students in their master's year who have not previously studied international economic law.

INAF 5508 [0.5 credit]

**Law, Politics and Economics in International Affairs**

The linkages and differences among the disciplines of law, politics and economics as they relate to international affairs; the underlying assumptions of each discipline and how they affect the way different issues in international affairs are considered.

Precludes additional credit for INAF 5409 (section F, taken 2003/04, 04/05).

INAF 5509 [0.5 credit]

**Law, Politics, and Economics in International Affairs**

Linkages and differences between the disciplines of law, political science and economics as they relate to international affairs. How underlying assumptions of each discipline affect the way different issues in international affairs are considered.

Prerequisite: M.A./LL.B standing in the Norman Paterson School of International Affairs or permission of the School.

INAF 5600 [0.5 credit]

**Human Resource Development**

The economic analysis and theory of the major areas of human development in developing areas, including demography and population, education, health, nutrition, women and development, social security, labour markets, and human resources planning. (Also offered as IDMG 5600.)

Prerequisite: M.A. standing in the Norman Paterson School of International Affairs or permission of the School.

INAF 5601 [0.5 credit]

**Social Theory and International Development**

This seminar examines the theoretical foundations for understanding international development policy and practice. It provides a space for thinking about development as a normative ideal and about the possibility of generating alternative horizons.

INAF 5602 [0.5 credit]

**Development Assistance: Theory and Practice**

Economic, moral, and political arguments for development assistance, aid effectiveness; the role of bilateral and multilateral donors; aid accounting, human development and human rights; NGOs and international assistance.

(Also offered as IDMG 5620.)

INAF 5603 [0.5 credit]

**Issues in Development in Africa**

Analysis of structures and processes of political, social, and economic change in intertropical Africa at scales ranging from the intrahousehold and local community to the state and international system. An objective will be to integrate gender and the environment into analyses which draw on theories of political economy.

INAF 5604 [0.5 credit]

**Issues in Development in Latin America**

Principal developmental trends, problems, and policies in the region since 1945; the design and implementation of future alternative developmental strategies.

INAF 5605 [0.5 credit]

**The Ethical Dimension of International Affairs**

Critical examination of the ethical dimensions of development, global conflict, and international political economy; beliefs and values, rights and obligations, individual and state morality.

INAF 5606 [0.5 credit]

**Indigenous Peoples and Development**

Major issues of the development, in its social, economic, political and environmental dimensions, of Indigenous peoples, including those of North America, Latin America, Australasia, India, Africa and the Polar regions.

INAF 5608 [0.5 credit]

**Indigenous Perspectives on Third World Development**

Some of the major perspectives and theories on Third World Development that have emerged from within the Third World. Included are authors representing structural, dependency, and radical theories of development, and those who see development as psychological or spiritual liberation.

INAF 5609 [0.5 credit]

**Development Project Evaluation and Analysis**

Examination of social cost-benefit analysis and other micro-economic methods of project evaluation in the context of the project cycle in developing countries with emphasis on policy analysis and implementation practice, case studies of development projects, including those of non-governmental organizations.

INAF 5701 [0.5 credit]

**Global Environmental Change: Human Implications**

Global environmental change; its significance for societies, economies and international relations. Value systems underlying environmental discourse; political economy of the environment; sustainability and security. Environmental diplomacy and grassroots environmentalism. Regionalized impacts of pressures on natural environments; challenges of adaptation. (Also listed as GEOG 5005.)

INAF 5702 [0.5 credit]

**International Environmental Affairs**

International environmental issues, with a focus on policy options and institutions relevant to addressing these issues. Topics include the relationship between the environment and trade, investment, globalization, development and conflict.

Precludes additional credit for INAF 5409 (formerly 46.549U)(taken in 2002/03).

INAF 5703 [0.5 credit]

**Economics of Institutions and Global Governance**

The economic analysis of institutions and of factors associated with global governance, including theories of cooperation, bureaucratic behaviour, externalities, common resource and environmental problems, public goods and other economic theories for state intervention applied to the international level.

INAF 5704 [0.5 credit]

**Human Security: From Policy to Practice**

Human security issues including perspectives of key governmental, international and non-governmental actors. Micro-disarmament, the protection of civilians, war economies, and post-conflict security issues.

(Also offered as IDMG 5604.)

Precludes additional credit for INAF 5409, section 'W' if taken in 2004/05 or 2005/06.

INAF 5705 [0.5 credit]

**International Social Policy**

Concepts of and approaches to international social policy. Concepts of social justice, comparative welfare regimes and citizenship. Topics include social reform, changes in the public/private provision of social services, participation in social policy, poverty reduction, health and education.

INAF 5706 [0.5 credit]

**Global Health Policy**

Global dimensions of health issues, including the relationship between health and governance, development, human rights, and security. Develop skills to examine global health challenges, such as HIV/AIDS and pandemic influenza, and to evaluate the international policy responses.

INAF 5707 [0.5 credit]

**Complex Humanitarian Emergencies**

The causes of humanitarian emergencies, their impact on civilians and the responses of national actors. Policy responses of the international community – including donor governments, multilateral organizations, the military and non-governmental organizations.

INAF 5709 [0.5 credit]

**Human Rights: International Politics and Policies**

Overview of key international human rights policies and debates. Themes include human rights and religion, development, trade, culture, and gender. Readings from applied and scholarly disciplines, focusing on the actions of governments, civil society, development agencies, international organizations and regional bodies.

(Also offered as IDMG 5605.)

INAF 5800 [0.5 credit]

**Asia Pacific Economic and Political Relations**

The evolving pattern of economic and political relations in the Asia-Pacific region. Topics will include security issues; trade and investment; and development cooperation; institutional arrangements, including ASEAN, APEC, AFTA, and Canada's role in the regional affairs.

INAF 5801 [0.5 credit]

**Regional Cooperation Among Developing Countries**

The discourse between traditional and Southern theorists on regional integration among developing countries. The effects of regional trade, governance, investment, security and environmental agreements on development.

INAF 5802 [0.5 credit]

**The International Political Economy of Transition**

Problems of reintegration into the world economy and dilemmas of transition from command to market economies. Topics may include new trade and investment patterns, role in regional and international economic organizations, search for appropriate exchange rate policies, impact of Western assistance. (Also listed as EURR 5102.)

INAF 5804 [0.5 credit]

**International Relations in Europe**

International relations and organizations in Europe from theoretical and historical perspectives. Origins and development of European organizations such as the European Union and the Organization for Security and Co-operation in Europe.

INAF 5805 [0.5 credit]

**The EU in International Affairs**

The impact of the EU on international affairs; the internal development of the EU, the evolution of integration theory, and the growth of the EU's external relations capabilities.

INAF 5806 [0.5 credit]

**Applied Techniques for Policy Research and Analysis**

Basic survey of applied research techniques. Methodological overviews plus tools for evaluating research quality. Themes include unanticipated consequences, cause and effect, case studies, ethnography, surveys, experimental methods, statistical studies, mixed methods, practitioner techniques. Recommended for Thesis and Essay students.

INAF 5901 [0.5 credit]

**Tutorials in International Affairs**

To be chosen in consultation with the director.

INAF 5904 [0.5 credit]

**Quantitative Research Methods**

A basic introduction into the theory and application of quantitative analysis, primarily applied basic econometrics for the constructions and analysis of data sets with standard software packages.

Precludes additional credit for INAF 6002.

Prerequisite: permission of the School.

INAF 5905 [0.5 credit]

**Qualitative Research Methods and Design**

Problem statements, research questions and approaches to knowledge acquisition in international affairs, focusing on policy relevance. Topics include advantages and limitations of inductive and deductive research methods, variable selection and hypothesis development, case studies and field research, data gathering, and methodology choice.

Precludes additional credit for INAF 6001.

Prerequisite: permission of the School.

INAF 5906 [1.0 credit]

**M.A./LL.B. Research Essay**

A research essay that allows an M.A./LL.B. student to integrate legal and international affairs studies in an analysis of a topic of his or her choice.

Prerequisite: permission of the School after the submission of a satisfactory proposal and identification of a suitable supervisory team.



## Graduate Courses - International Affairs (INAF)

INAF 5908 [1.0 credit]

**Research Essay**

A research essay option that allows an M.A. student to apply their international affairs studies to a topic of his or her choice.

Prerequisite: permission of the School after the submission of a satisfactory proposal and identification of a suitable supervisory team.

INAF 5909 [2.0 credits]

**M.A. Thesis**

A research thesis option that allows a student in the M.A. program to combine original research with international affairs studies in an analysis of a topic of his or her choice.

Prerequisite: A- average in all M.A. required courses and a minimum of 3.0 full course credits, permission of the School after the submission of a satisfactory proposal and identification of a suitable supervisory team.

INAF 5911 [0.0 credit]

**Co-operative Work Term**

Prerequisites: registration in the Co-operative Education Option of the Master of Arts program and permission of the School.

INAF 5912 [0.0 credit]

**Co-operative Work Term**

Prerequisites: registration in the Co-operative Education Option of the Master of Arts program, completion of INAF 5911, and permission of the School.

INAF 5913 [0.0 credit]

**Co-operative Work Term**

Prerequisites: registration in the Co-operative Education Option of the Master of Arts program, completion of INAF 5911 and INAF 5912 and permission of the School.

INAF 5919 [2.0 credits]

**M.A./LL.B. Thesis**

A research thesis option that allows a student in the M.A./LL.B. program to combine original research with legal and international affairs studies in an analysis of a topic of his or her choice.

Prerequisite: A- average in all M.A. required courses and a minimum of 3.0 full course credits, permission of the School after the submission of a satisfactory proposal and identification of a suitable supervisory team.

INAF 5921 [0.5 credit]

**Tutorial in International Affairs**

Prerequisite: permission of the School.

INAF 5922 [0.5 credit]

**Tutorial in International Affairs**

Prerequisite: permission of the School.

INAF 5923 [0.5 credit]

**Tutorial in International Affairs**

Prerequisite: permission of the School.

INAF 5924 [0.5 credit]

**Tutorial in International Affairs**

Prerequisite: permission of the School.

INAF 5925 [0.5 credit]

**Tutorial in International Affairs**

Prerequisite: permission of the School.

INAF 6001 [0.5 credit]

**Qualitative Research Methods and Design**

Problem statements, research questions and approaches to knowledge acquisition in international affairs, focusing on policy relevance. Topics include advantages and limitations of inductive and deductive research methods, variable selection and hypothesis development, case studies and field research, data

gathering, and methodology choice.

Precludes additional credit for INAF 5905.

Prerequisite: standing in the NPSIA Ph.D. program or permission of the School.

INAF 6002 [0.5 credit]

**Quantitative Methods**

Basic theory and application of quantitative analysis, primarily applied basic econometrics for the construction and analysis of data sets with standard software packages.

Precludes additional credit for INAF 5915.

Prerequisite: standing in the NPSIA Ph.D. program or permission of the School.

INAF 6003 [0.5 credit]

**Advanced International Policy Analysis**

International public policies of a number of countries, including Canada; approaches to the policy process and case studies of the formulation and evaluation of economic, political, and security policies.

Precludes additional credit in INAF 5406.

Prerequisite: standing in the NPSIA Ph.D. program or permission of the School.

INAF 6100 [0.5 credit]

**Doctoral Field Seminar in Conflict Management and Resolution**

Core readings on conflict analysis, management and prevention; peacebuilding, security, terrorism and arms control.

Prerequisite: enrolment in the NPSIA Ph.D. program or permission of the School.

INAF 6101 [0.5 credit]

**Comprehensive Examination in Conflict Management and Resolution**

A comprehensive examination covering interdisciplinary and policy-oriented research on key policy issues in security, conflict analysis, management and prevention.

Prerequisite: enrolment in the NPSIA Ph.D. program or permission of the School.

INAF 6200 [0.5 credit]

**Doctoral Field Seminar in International Development Policy**

Core readings in international development policy, including concepts and measures of development, basic theoretical approaches to understanding development, and key policy issues such as foreign aid, economic policies, adjustment, health, environment institutions and governance.

Prerequisite: enrolment in the NPSIA Ph.D. program or permission of the School.

INAF 6201 [0.5 credit]

**Comprehensive Examination in International Development Policy**

A comprehensive examination covering interdisciplinary and policy-oriented research on key policy issues in the management of the global economy.

Prerequisite: Enrolment in the NPSIA Ph.D. program or permission of the School.

INAF 6300 [0.5 credit]

**Doctoral Field Seminar in International Economic Policy**

INAF 6301 [0.5 credit]

**Comprehensive Examination in International Economic Policy**

A comprehensive examination covering interdisciplinary and policy-oriented research on key policy issues in the management of the global economy.

Prerequisite: enrolment in the NPSIA Ph.D. program or permission of the School.



INAF 6900 [0.5 credit]

**Doctoral Research Seminar**

A seminar where research issues are discussed. Satisfactory completion of the seminar requires the successful public defence of a research prospectus that will be the basis for the dissertation. Prerequisite: second-year standing in the NPSIA Ph.D. program.

INAF 6909 [5.0 credits]

**Ph.D. Thesis**

## International Business (IBUS)

### Sprott School of Business

IBUS 5701 [0.25 credit]

#### **International Business**

Managerial and strategic implications of differing international environments for a variety of business functions including structure and control, managing human resources, marketing, finance and logistics. Complexities of working across political and cultural boundaries.

Precludes additional credit for BUSI 5300 (no longer offered).

IBUS 5711 [0.25 credit]

#### **International Marketing and Trade**

Models for understanding factors that influence buyer decisions in different markets. Product adaptation, distribution networks, promotion practices, cross-border pricing strategy and regulatory and other limitations. The macro and micro effects of culture provide a connecting theme.

Precludes additional credit for BUSI 5301 (no longer offered).

IBUS 5712 [0.25 credit]

#### **Business and Government in Emerging Economies**

Projects in emerging economies often involve partnerships between businesses, local governments and foreign donors. Emerging forms of cooperation which address issues of poverty, infrastructure and education. The role of international firms in the process of economic transition.

Precludes additional credit for BUSI 5300 (no longer offered).

IBUS 5713 [0.25 credit]

#### **Doing Business in the United States**

The role of the United States as Canada's most important foreign trade partner. The U.S. as a distinct business environment. Regulatory structures, competitive environment, buyer behaviour and business culture in the U.S. and Canada.

Precludes additional credit for BUSI 5300 (no longer offered).

IBUS 5721 [0.25 credit]

#### **Regional and Global Business Strategies**

##### **Concentration Integration**

Regional and global business expansion strategies and how global interdependence and regional trade groups affect international investment and marketing strategies. Environmental and political factors that influence policy within and between trade blocs and how businesses participate in these processes.

Precludes additional credit for BUSI 5301 (no longer offered).

Prerequisite: successful completion of all courses in the International Business concentration. Students in the Minor in International Business must have successfully completed 0.75 credits from courses in the International Business concentration.

# International Development Management (IDMG)

## Sprott School of Business

IDMG 5600 [0.5 credit]

### Human Resource Development

The economic analysis and theory of the major areas of human development in developing areas, including demography and population, education, health, nutrition, women and development, social security, labour markets, and human resources planning. (Also listed as INAF 5600.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5601 [0.5 credit]

### Conflict and Development

Examination of competing interpretations of conflict in developing countries; material conditions, institutional factors, and ideological, or identity-based framing processes. The impact of war on development, and implications for policy. (Also listed as INAF 5209.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5602 [0.5 credit]

### Issues in International Development

International political, social and economic aspects of development. Approaches to trade policies, finance, regional integration, technology transfer and transnational enterprises, global governance, international civil society and development, the environment and natural resources, and social and labour issues in the international context. (Also listed as INAF 5002.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5603 [0.5 credit]

### National and Domestic Dimensions of Development

Theoretical foundations and central policy issues of the domestic, economic, social, political, cultural and environmental aspects of development. Topics include theories of the developmental process, human resource development, national development strategies, sectoral issues, and governance and human rights and their interaction with the international system. (Also listed as INAF 5003.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5604 [0.5 credit]

### Human Security: From Policy to Practice

Human security issues including perspectives of key governmental, international and non-governmental actors. Micro-disarmament, the protection of civilians, war economies, and post-conflict security issues. (Also listed as INAF 5704.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5605 [0.5 credit]

### Human Rights: International Politics and Policies

Overview of key international human rights policies and debates. Themes include human rights and religion, development, trade, culture, and gender. Readings from applied and scholarly disciplines, focusing on the actions of governments, civil society, development agencies, international organizations

and regional bodies

(Also listed as INAF 5709.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5606 [0.5 credit]

### Agriculture and Rural Development

A study of the agricultural sector, rural areas, and rural welfare in developing countries, including structural change in agriculture, agrarian reform, rural development strategies in various countries, and public policies affecting agriculture, activities ancillary to agriculture, rural industry, and public service. (Also listed as INAF 5006.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5607 [0.5 credit]

### Global Health Policy

Global dimensions of health issues, including the linkages between health and development, international trade and economic policy, and human security. Approaches to understanding health challenges and examines the international policy framework for meeting them. (Also listed as INAF 5706.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5609 [0.5 credit]

### International Aspects of Economic Development

Economic theory and policy dimensions of key issues in international economic development. Topics include: trade theory and policy for developing countries; debt, adjustment and macroeconomic stabilization; the role of international financial institutions; financial flows and the role of multinational corporations. (Also listed as INAF 5009.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5615 [0.5 credit]

### Civil Society Organizations and Development

The context, roles, structures and strategies of nongovernmental organizations in the development process at the global, national and local levels. The role of development aid and NGOs is considered. (Also listed as PADM 5815.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5616 [0.5 credit]

### Program Evaluation in Developing Countries

The context, critical issues and methods relating to the evaluation of development interventions. (Also listed as PADM 5816.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5617 [0.5 credit]

### Health Policy in Developing Countries

Debates regarding health policy in the developing world, in the context of the global health sector reform movement, trade and intellectual property regimes, and strategies of corporate and NGO actors. Issues of gender, class and the determinants of health. (Also listed as PADM 5817.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

## Graduate Courses - International Development Management (IDMG)

IDMG 5619 [0.5 credit]

### **Rights, Development and Conflict**

Uses economic institutionalism to examine the intersection of development and conflict, focusing on how the connection between property rights and development affects conflict. Topics include gender, land conflict, urban peripheries, migration and refugees, domestic and transnational crime, and state violence

(Also listed as INAF 5219.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

IDMG 5620 [0.5 credit]

### **Development Assistance Theory and Practice**

Economic, moral, and political arguments for development assistance, aid effectiveness; the role of bilateral and multilateral donors; aid accounting, human development and human rights; NGOs and international assistance.

(Also listed as INAF 5602.)

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.



## Journalism (JOUR)

### School of Journalism and Communication

JOUR 5000 [0.5 credit]

#### Journalism and Society I

An introduction to analysis of the news media in Western society, considering classical arguments and contemporary trends in the scholarly assessment of journalism practice.

JOUR 5200 [1.0 credit]

#### Print Journalism Laboratory

A laboratory course in basic reporting and editing techniques and introduction to multimedia reporting, followed by application in print and multimedia.

JOUR 5202 [1.0 credit]

#### Broadcast Journalism Laboratory

A laboratory course in reporting and editing in the broadcast media.

JOUR 5206 [0.5 credit]

#### Reporting Methods

Topics covered will range from interviewing and observation skills to conducting a title search, lodging an access to information request and interpreting data.

JOUR 5208 [0.5 credit]

#### Public Affairs Reporting

A course devoted to understanding selected political, economic and social issues, and to analytical reporting on timely issues under professional conditions.

JOUR 5305 [0.5 credit]

#### Perspectives on Modern Society

A seminar course examining texts from the social sciences, philosophy, literature, and journalism for the contribution they make to an understanding of issues facing modern industrial society.

JOUR 5401 [0.5 credit]

#### Journalism Law

This course prepares journalists to function comfortably within the legal and ethical guidelines governing their occupation. Topics include: contempt of court; free press, fair trial; revealing of sources; civil defamation; obscenity; privacy; government secrecy.

JOUR 5208 [0.5 credit]

#### Public Affairs Reporting

A course devoted to understanding selected political, economic and social issues, and to analytical reporting on timely issues under professional conditions.

JOUR 5500 [0.5 credit]

#### Journalism and Society II

A critical examination of the conduct of the news media, exploring the social, political and economic contexts in which the media work and assessing the consequences of journalism practice for contemporary society.

Prerequisite: JOUR 5000 or permission of the School.

JOUR 5508 [0.5 credit]

#### Professional Practices: Specialized Media

A workshop course designed to give students instruction in specialized areas such as radio documentary, video documentary, editing, magazine writing, photojournalism. Not all specialties will be offered each year. Also offered at the undergraduate level, with different requirements, as JOUR 4208 for which additional credit is precluded.

JOUR 5700 [1.0 credit]

#### Print Journalism

Students will explore and apply advanced journalistic principles and practices through a combination of readings, discussion and reporting in specific areas.

JOUR 5702 [1.0 credit]

#### Broadcast Journalism

A seminar combining critical analysis of television journalism and practical skill development in television reporting, writing and production.

JOUR 5704 [0.5 credit]

#### Advanced Reporting (Print)

Designed to enhance reporting and editing skills through the production of a community newspaper, Centretown News.

Precludes additional credit for JOUR 5701 [1.0] (no longer offered).

JOUR 5705 [0.5 credit]

#### Advanced Reporting (Online Publishing)

Designed to enhance reporting and editing skills through the production of online publications such as Capital News Online.

Precludes additional credit for JOUR 5701 [1.0] (no longer offered).

JOUR 5706 [0.5 credit]

#### Professional Practices

Students examine current journalism practices in a critical and analytical way, and explore ways of producing thorough and investigative journalism in print, broadcast and multimedia. Guest speakers share their expertise and skills.

JOUR 5707 [0.5 credit]

#### Advanced Reporting (Radio)

Enhances radio reporting and production skills to include news features and mini-documentaries, preparation and presentation of public affairs programs, and multimedia delivery.

Precludes additional credit for JOUR 5703[1.0] (no longer offered).

JOUR 5708 [0.5 credit]

#### Advanced Reporting (Television)

Enhances television reporting and production skills to include news features and mini-documentaries, preparation and presentation of public affairs programs, and multimedia delivery.

Precludes additional credit for JOUR 5703[1.0] (no longer offered).

JOUR 5800 [0.5 credit]

#### Survey Methods for Journalists

An examination of basic research design and data collection with emphasis on problems of interpretation.

JOUR 5808 [0.5 credit]

#### Directed Readings

Students, working under faculty direction, will undertake an intensive reading schedule in order to pursue a subject area of particular interest.

JOUR 5809 [0.5 credit]

#### Directed Research

Students, working under faculty direction, will develop and undertake a research project in order to pursue a subject area of particular interest.

JOUR 5900 [1.0 credit]

#### Directed Studies

Reading and research tutorials.

JOUR 5901 [0.5 credit]

#### Directed Studies

Reading and research tutorials.

## Graduate Courses - Journalism (JOUR)

JOUR 5908 [1.0 credit]

### **M.J. Research Project**

The student will complete a substantial piece of public affairs journalism; or a research project on the media; or a document that makes a major contribution to journalism education. The format of the MRP will be determined by the stream of study.

JOUR 5909 [2.0 credits]

### **M.J. Thesis**

To fulfil the requirements of this 2.0-credit thesis course, students must produce a major piece of journalistic research or complete an academic thesis in the area of journalism studies.

## Law (LAWS)

### Department of Law

LAWS 5000 [0.5 credit]

#### Theories of Law and Social Transformation

Examines three groups of theories of law (liberal, sociological and Marxist) focusing on different ways law is conceived as an object of inquiry and on different accounts of trajectories of legal development. Potential of law for realizing or inhibiting social change provides analytic framework.

LAWS 5001 [0.5 credit]

#### Legal Method and Social Inquiry

Introduces problems of research strategy and methods. Explores contrasting methodologies in legal research; evaluates methodologies employed in understanding legal reasoning, discourses, and practices. Includes seminars in which participants present outlines of their own research projects, focusing on methodologies and research questions.

LAWS 5002 [0.5 credit]

#### Law and Gender Relations

Examines theoretical approaches informed by significance of gender to structure and operation of law. Concepts such as essentialism, difference, cultural determination, and social construction of gender relations examined in context of contemporary feminist debates. Focus on understanding and facility with feminist analysis and methodology.

LAWS 5003 [0.5 credit]

#### Law, Economy and Society

Addresses the relationship between law, economy, and society. Competing theoretical accounts of the relationship between legal regulation and social and economic change explored through selected historical and contemporary case studies.

LAWS 5004 [0.5 credit]

#### Law, Crime and Social Order

Examines theoretical dimensions of relationship between law, state, crime, and social order. Explores scope and limitations of criminal justice system as an agency of social control. Examines shifts in forms of social order and their relation to changes in criminal law and sanctions.

LAWS 5005 [0.5 credit]

#### Law, State and Politics

Examines theoretical explanations of relationships between law, state and politics. Selected areas such as rights theory, rule of law, separation of powers or judicial review may provide focus.

LAWS 5006 [0.5 credit]

#### Historical Perspectives on Law and Society

Examines historical relationship between social forces, law and legal institutions and utility of historical forms of knowledge and methods to legal studies. Surveys selected issues in private, public and criminal law.

LAWS 5007 [0.5 credit]

#### Race, Ethnicity and the Law

Examines ways race and racism interact with gender and class in shaping legal system. Explores ways legal system institutionalizes racism and potential for using the legal system to combat racism. Selected areas such as immigration law and native rights may be used to illustrate themes.

LAWS 5008 [0.5 credit]

#### Consuming Passions: The Regulation of Consumption, Appearance and Sexuality

Examines rise of consumption and private pleasures and their regulation and self-regulation. Social history of regulation of two fields of consumption: surfaces of the person: personal appearance, in particular of dress, the body, sexuality; and intakes of the body, focusing on food, alcohol, drugs. (Also listed as SOCI 5204.)

LAWS 5100 [0.5 credit]

#### Advanced Problems in Legal Philosophy

Studies in legal theory and analyses of law advanced by Hart, Dworkin, and others, and legal concepts: for example, principles, rights, duties, liability, etc. Precise course content will vary from year to year and will be announced at the beginning of the term. (Also listed as PHIL 5100.)

Prerequisites: either LAWS 3105 or LAWS 3101 (PHIL 3101) and LAWS 3102 (PHIL 3102), or permission of the Department.

LAWS 5200 [0.5 credit]

#### International Economic Law: Regulation of Trade and Investment

Study of regulation of international economic activity. Discussion of relevant international institutions, legal aspects of integration, governmental regulation of trade and investment. (Also listed as INAF 5507.)

Prerequisite: Open only to students in their master's year who have not studied international economic law.

LAWS 5302 [0.5 credit]

#### Feminism, Law and Social Transformation

Exploration of nature and possibilities of feminist engagement with law. Policies and strategies of law reform and/or social transformation formulated and evaluated through application of theoretical frameworks to particular topics. Significance of Canadian Charter of Rights and Freedoms and human rights legislation is examined.

LAWS 5305 [0.5 credit]

#### Crime, Social Change and Criminal Law Reform

Examination of the ideological and practical consequences of criminal law reform and policy initiatives undertaken by the state. Specific reform proposals examined to illustrate possible alternate responses to social problems and the varying effects of these responses.

LAWS 5306 [0.5 credit]

#### Police and Capital

The idea of 'police' as a general historical project aimed at the fabrication of social order and the development of liberal philosophy, political economy and security. Contemporary public and private security provision considered in light of commodification, class conflict, and risk thinking. (Also listed as SOCI 5305.)

LAWS 5500 [0.5 credit]

#### The Canadian Constitution

Familiarizes students with terminology, principles, and doctrines of judicial interpretation of Constitution Acts 1867-1982 and other constitutional statutes. Emphasis on division of legislative powers in the Canadian federation.

Prerequisite: open only to graduate students in their master's year who have not previously studied Canadian constitutional law.

Graduate Courses - Law (LAWS)

LAWS 5603 [0.5 credit]

**International Law: Theory and Practice**

Examines various theoretical perspectives on international law and locates role international law plays in the international system. Topics include basis, creation and sources of international law, international dispute resolution, and international law and world order transformation. (Also listed as INAF 5505.)

LAWS 5900 [0.5 credit]

**Tutorials/Directed Readings in Law**

Tutorials or reading courses on selected topics may be arranged with the permission of the supervisor of graduate studies and the approval of the supervising faculty member.

LAWS 5901 [0.5 credit]

**Tutorial/Directed Readings in Law**

Tutorials or reading courses on selected topics may be arranged with the permission of the supervisor of graduate studies and the approval of the supervising faculty member.

LAWS 5903 [0.5 credit]

**Contemporary Topics in Legal Studies**

A research seminar which explores a selected topic from current debates in legal studies. Students should check with the Department regarding the topic offered.

LAWS 5904 [0.5 credit]

**Contemporary Topics in Legal Studies**

A research seminar which explores a selected topic from current debates in legal studies.

LAWS 5908 [1.0 credit]

**M.A. Research Essay**

LAWS 5909 [2.0 credits]

**M.A. Thesis**

LAWS 6000 [0.5 credit]

**Doctoral Seminar in Legal Studies**

Analysis of the major themes, approaches and literature in contemporary legal and social theory.

LAWS 6001 [0.5 credit]

**Proseminar in Legal Studies**

A seminar which meets every two weeks throughout the academic year. Based on presentations of papers and works in progress by faculty, students and invited guests, as well as assigned readings on issues that deal with current research in legal studies.

LAWS 6002 [0.5 credit]

**Law, Regulation and Governance**

Historical and contemporary roles of law and regulation in processes, practices and discourses of governance. Law and state; domestic and global governance; diversity of law-governance relationships; law as a constituent force, enforcement mechanism and a distinctive product of governance.

LAWS 6003 [0.5 credit]

**Human Rights, Citizenship and Global Justice**

The implications of law in selected issues involving human rights, citizenship and global justice. Topics may include justification and legitimation of human rights, contemporary citizenship, struggles for global justice, recognition and democracy, and post-nationalism and global economic regulation.

LAWS 6004 [0.5 credit]

**Crime, Law, and Security**

Contemporary debates around crime, criminal justice and security as mediated through law. The interrelationship between the politics, process and reform of criminal justice in a socio-legal context.

LAWS 6010 [0.5 credit]

**Directed Readings in Legal Studies**

Advanced directed readings in selected areas of legal studies, involving presentation of papers as the basis for discussion with the course instructor.

LAWS 6095 [1.0 credit]

**Field Comprehensive**

The field comprehensive examination will focus on the relevant theoretical and/or methodological issues related to the field of study. The examination can take a variety of forms and will be decided by the supervisory committee in consultation with the student. The form of the exam will be in accordance with departmental policy.

LAWS 6096 [1.0 credit]

**Thesis Proposal**

The thesis proposal must be written after the completion of the other course requirements, and normally will be completed by the end of the second year of doctoral study. The proposal is defended at an oral examination conducted by the supervisory committee. Evaluation is on the basis of Pass/Fail.

LAWS 6909 [5.5 credits]

**Ph. D. Thesis**



## Management (MGMT)

### Sprott School of Business

MGMT 5100 [0.5 credit]

#### Managing People and Organizations

Understanding organizations and the relationships that define them. Theories, concepts and experiential exercises help students understand their own values, attitudes and goals and those of others how to motivate, communicate, teach and lead others; and how to apply these concepts to improving personal and organizational performance.

Precludes additional credit for MGMT 5101 and MGMT 5102.

MGMT 5101 [0.25 credit]

#### Managing People

Understanding organizations through the relationships that define them. Theories, concepts and experiential exercises are used to help students understand their own values, attitudes and goals; how to motivate, communicate, teach and lead others, and how to apply these concepts to improving personal and organizational performance.

Precludes additional credit for BUSI 5100 (no longer offered).

MGMT 5102 [0.25 credit]

#### Managing Organizations

The design and function of complex organizations including the effects of size, environment, and technology on organizational structures and systems. Sources of uncertainty and strategies for managing environmental relationships. Work teams, group dynamics and organizational culture.

Precludes additional credit for BUSI 5101.

Prerequisite: MGMT 5101

MGMT 5111 [0.25 credit]

#### Conflict and Negotiation

Conflict, negotiation and bargaining. The bargaining process, conflict handling and how to analyze, plan and implement successful negotiations. Management and labour objectives and strategies that lead to conflict.

MGMT 5112 [0.25 credit]

#### Power and Influence

The role of power and influence in organizations. Sources of power, the effectiveness of various influence tactics, the implications of powerlessness, types of empowerment, organizational politics and fostering constructive versus destructive political behaviour in organizations.

Precludes additional credit for BUSI 5101.

MGMT 5113 [0.25 credit]

#### Managing Teams

Factors affecting team performance. Team development, the impact of team size, team processes, organizational practices that support teams, potential team interventions and the unique challenges faced by virtual teams.

MGMT 5114 [0.25 credit]

#### Managing Diversity

Exploration of issues arising from diversity within organizations including the implications of cultural differences for motivation, communication, conflict and leadership. Identification of practices that facilitate the effective management of diversity.

MGMT 5115 [0.25 credit]

#### Leadership

Post-heroic leadership theories, with a practical emphasis on developing and honing leadership skills in practicing managers. A highly self-reflective course, requiring students to question and share their own leadership styles and situational antecedents.

MGMT 5116 [0.25 credit]

#### Managing Performance

Principles and techniques relating to the development, support, and evaluation of employee performance in organizations. Models of individual and organizational performance; identifying high performing employees; methods of measuring performance; employee development and incentive systems.

MGMT 5117 [0.25 credit]

#### Knowledge Management

Knowledge as a resource; methodologies for managing ongoing and future knowledge needs in businesses. As required knowledge is dispersed and developed throughout the globe, international dimensions of knowledge management.

MGMT 5120 [0.5 credit]

#### Fundamentals of Leading and Managing Organizational Change

How individuals, groups and organizations respond to change; overview of key change models and change strategy. At the micro level how individuals respond to change, how change should be managed, change management competencies and changing organizational culture.

Precludes additional credit for MGMT 5121 and MGMT 5122

Prerequisite: successful completion of all Management and Change concentration courses; students in minor concentration in Management and Change must have at least 0.5 credit (or the equivalent) from the Management and Change concentration courses.

MGMT 5121 [0.25 credit]

#### Fundamentals of Organizational Change Concentration Integration

A macro view of organizational change. The nature of change, forces for and against change, tools to diagnose what needs to be changed, and various change strategies. Key conceptual models for understanding organizational change.

Precludes additional credit for BUSI 5806 (no longer offered).

Prerequisite: successful completion of all Management and Change concentration courses. Students taking a minor concentration in Management and Change must have completed 0.5 credits (or the equivalent) of Management and Change concentration courses.

MGMT 5122 [0.25 credit]

#### Leading and Managing Organizational Change Concentration Integration

What change means for individuals and groups. Conceptual models for understanding change at the micro level. Responses to change, managing its negative impacts, gaining commitment to change, change management competencies and changing organizational culture.

Precludes additional credit for BUSI 5806 (no longer offered).

Prerequisite: MGMT 5121 and successful completion of all Management and Change concentration courses; students in minor concentration in Management and change must have at least 0.5 credits (or the equivalent) from the Management and Change concentration courses.

## Marketing (MKTG)

### Sprott School of Business

MKTG 5200 [0.5 credit]

#### **Marketing Strategy**

Essential concepts for cultivating and maintaining successful buyer-seller relationships, including customer and competitor analysis, segmentation, targeting, and positioning. Translation of target market and positioning decisions into actionable marketing plans, including product, pricing, channel and promotional decisions, and tools for forecasting/evaluating success.

Precludes additional credit for MKTG 5201 and MKTG 5202.

MKTG 5201 [0.25 credit]

#### **Marketing Strategy Formulation**

Basic concepts underlying development and sustaining of successful buyer-seller relationships including the core concepts and practice of marketing, the role of marketing in the organization, relationship and exchange bases, environmental scanning, competitor assessment, marketing research, segmentation, positioning, targeting of markets and strategy planning.

Precludes additional credit for BUSI 5204 (no longer offered).

MKTG 5202 [0.25 credit]

#### **Marketing Strategy Implementation**

Development and implementation of marketing strategy and plans, including interpretation of strategic positioning into product, promotion, pricing and channel decisions and the measurement and tracking of marketing success. Special attention to the role of product innovation and introduction.

Precludes additional credit for BUSI 5200 (no longer offered).

Prerequisite: MKTG 5201.

MKTG 5211 [0.25 credit]

#### **Technology Marketing**

Marketing in technology-intensive environments, with focus on business buying processes. Buyer behaviour, competitive and environmental analysis, planning and implementation of product and service innovations, targeting and positioning in the early stages of introduction, management through the growth stages, tracking success and contingency planning.

## Mathematics (MATH)

### School of Mathematics and Statistics

MATH 5003 [0.5 credit] (MAT 5122)

#### Banach Algebras

Commutative Banach algebras; the space of maximal ideals; representation of Banach algebras as function algebras and as operator algebras; the spectrum of an element. Special types of Banach algebras: for example, regular algebras with involution, applications.

MATH 5005 [0.5 credit] (MAT 5127)

#### Complex Analysis

Complex differentiation and integration, harmonic functions, maximum modulus principle, Runge's theorem, conformal mapping, entire and meromorphic functions, analytic continuation.

MATH 5007 [0.5 credit] (MAT 5125)

#### Real Analysis I (Measure Theory and Integration)

General measure and integral, Lebesgue measure and integration on  $\mathbb{R}$ , Fubini's theorem, Lebesgue-Radon-Nikodym theorem, absolute continuity and differentiation,  $L^p$ -spaces. Selected topics such as Daniell-Stone theory. Also offered, with different requirements, as MATH 4007 for which additional credit is precluded.

Prerequisites: MATH 3001 or permission of the School.

MATH 5008 [0.5 credit] (MAT 5126)

#### Real Analysis II (Functional Analysis)

Banach and Hilbert spaces, bounded linear operators, dual spaces. Topics selected from: weak-topologies, Alaoglu's theorem, compact operators, differential calculus in Banach spaces, Riesz representation theorems. Also offered, with different requirements, as MATH 4003 for which additional credit is precluded.

Prerequisite: MATH 4007 or MATH 5007 (MAT 5125) or permission of the School.

MATH 5009 [0.5 credit] (MAT 5121)

#### Introduction to Hilbert Space

Geometry of Hilbert Space, spectral theory of linear operators in Hilbert Space.

Prerequisites: MATH 3001 and MATH 4003.

MATH 5102 [0.5 credit] (MAT 5148)

#### Group Representations and Applications

An introduction to group representations and character theory, with selected applications.

MATH 5103 [0.5 credit] (MAT 5146)

#### Rings and Modules

Generalizations of the Wedderburn-Artin theorem and applications, homological algebra.

MATH 5104 [0.5 credit] (MAT 5143)

#### Lie Algebras

Basic concepts: ideals, homomorphisms, nilpotent, solvable, semi-simple. Representations, universal enveloping algebra. Semi-simple Lie algebras: structure theory, classification, and representation theory.

Prerequisites: MATH 5107 (MAT 5141) and MATH 5109 (MAT 5142) or permission of the School.

MATH 5106 [0.5 credit] (MAT 5145)

#### Group Theory

Fundamental principles as applied to abelian, nilpotent, solvable, free, and finite groups; representations. Also offered, with different requirements, as MATH 4106, for which additional credit is precluded.

Prerequisite: MATH 3106 or permission of the School.

MATH 5107 [0.5 credit] (MAT 5141)

#### Algebra I

Groups, Sylow subgroups, finitely generated abelian groups. Rings, field of fractions, principal ideal domains, modules. Polynomial algebra, Euclidean algorithm, unique factorization.

Prerequisite: permission of the School.

MATH 5108 [0.5 credit] (MAT 5147)

#### Homological Algebra and Category Theory

Axioms of set theory, categories, functors, natural transformations; free, projective, injective and flat modules; tensor products and homology functors, derived functors; dimension theory. Also offered, with different requirements, as MATH 4108 for which additional credit is precluded.

Prerequisite: MATH 3106 and MATH 3158 or permission of the School.

MATH 5109 [0.5 credit] (MAT 5142)

#### Algebra II

Field theory, algebraic and transcendental extensions, finite fields, Galois groups. Modules over principal ideal domains, decomposition of a linear transformation, Jordan normal form.

Prerequisites: MATH 5107 (MAT 5141) and permission of the School.

MATH 5201 [0.5 credit] (MAT 5150)

#### Topics in Geometry

Various axiom systems of geometry. Detailed examinations of at least one modern approach to foundations, with emphasis upon the connections with group theory.

Prerequisite: permission of the School.

MATH 5202 [0.5 credit] (MAT 5168)

#### Homology Theory

The Eilenberg-Steenrod axioms and their consequences, singular homology theory, applications to topology and algebra.

Prerequisite: MATH 4205 or MATH 5205 (MAT 5151).

MATH 5205 [0.5 credit] (MAT 5151)

#### Topology I

Topological spaces, product and identification topologies, countability and separation axioms, compactness, connectedness, homotopy, fundamental group, net and filter convergence. Also offered, with different requirements, as MATH 4205 for which additional credit is precluded.

Prerequisite: MATH 3001 or permission of the School.

MATH 5206 [0.5 credit] (MAT 5152)

#### Topology II

Covering spaces, homology via the Eilenberg-Steenrod Axioms, applications, construction of a homology functor. Also offered, with different requirements, as MATH 4206 for which additional credit is precluded.

Prerequisites: MATH 3106, MATH 3158 and MATH 5205 (MAT 5151) or permission of the School.

MATH 5207 [0.5 credit] (MAT 5169)

#### Foundations of Geometry

A study of at least one modern axiom system of Euclidean and non-Euclidean geometry, embedding of hyperbolic and Euclidean geometries in the projective plane, groups of motions, models of non-Euclidean geometry.

Prerequisite: MATH 3106 (may be taken concurrently) or permission of the School.

MATH 5208 [0.5 credit] (MAT 5155)

**Differentiable Manifolds**

A study of differentiable manifolds from the point of view of either differential topology or differential geometry. Topics such as smooth mappings, transversality, intersection theory, vector fields on manifolds, Gaussian curvature, Riemannian manifolds, differential forms, tensors, and connections are included.

Prerequisite: MATH 3001 or permission of the School.

MATH 5300 [0.5 credit] (MAT 5160)

**Mathematical Cryptography**

Analysis of cryptographic methods used in authentication and data protection, with particular attention to the underlying mathematics, e.g. Algebraic Geometry, Number Theory, and Finite Fields. Advanced topics on Public-Key Cryptography: RSA and integer factorization, Diffie-Hellman, discrete logarithms, elliptic curves. Topics in current research.

Prerequisite: undergraduate honours algebra, including group theory and finite fields.

MATH 5301 [0.5 credit] (MAT 5161)

**Mathematical Logic**

A basic graduate course in mathematical logic. Propositional and predicate logic, proof theory, Gentzen's Cut-Elimination, completeness, compactness, Henkin models, model theory, arithmetic and undecidability. Special topics (time permitting) depending on interests of instructor and audience.

Prerequisites: Honours undergraduate algebra, analysis and topology or permission of the instructor.

MATH 5305 [0.5 credit] (MAT 5163)

**Analytic Number Theory**

Dirichlet series, characters, Zeta-functions, prime number theorem, Dirichlet's theorem on primes in arithmetic progressions, binary quadratic forms. Also offered at the undergraduate level, with different requirements, as MATH 4305, for which additional credit is precluded.

Prerequisite: MATH 3057 or permission of the School.

MATH 5306 [0.5 credit] (MAT 5164)

**Algebraic Number Theory**

Algebraic number fields, bases, algebraic integers, integral bases, arithmetic in algebraic number fields, ideal theory, class number. Also offered, with different requirements, as MATH 4306 for which additional credit is precluded.

Prerequisite: MATH 3158 or permission of the School.

MATH 5403 (MAT 5187) [0.5 credit]

**Topics in Applied Mathematics**

MATH 5405 [0.5 credit] (MAT 5131)

**Ordinary Differential Equations**

Linear systems, fundamental solution. Nonlinear systems, existence and uniqueness, flow. Equilibria, periodic solutions, stability. Invariant manifolds and hyperbolic theory. One or two specialized topics taken from, but not limited to: perturbation and asymptotic methods, normal forms and bifurcations, global dynamics.

Prerequisite: MATH 3008 or permission of the School.

MATH 5406 [0.5 credit] (MAT 5133)

**Partial Differential Equations**

First-order equations, characteristics method, classification of second-order equations, separation of variables, Green's functions.  $L_p$  and Sobolev spaces, distributions, variational formulation and weak solutions, Lax-Milgram theorem, Galerkin approximation. Parabolic PDEs. Wave equations, hyperbolic systems, nonlinear PDEs, reaction-diffusion equations, infinite-dimensional dynamical systems, regularity.

Prerequisite: MATH 3008 or permission of the School.

MATH 5407 [0.5 credit] (MAT 5134)

**Topics in Partial Differential Equations**

Theory of distributions, initial-value problems based on two-dimensional wave equations, Laplace transform, Fourier integral transform, diffusion problems, Helmholtz equation with application to boundary and initial-value problems in cylindrical and spherical coordinates. Also offered, with different requirements, as MATH 4701 for which additional credit is precluded.

Prerequisite: MATH 5406 or permission of the School.

MATH 5408 [0.5 credit] (MAT 5185)

**Asymptotic Methods of Applied Mathematics**

Asymptotic series: properties, matching, application to differential equations. Asymptotic expansion of integrals: elementary methods, methods of Laplace, Stationary Phase and Steepest Descent, Watson's Lemma, Riemann-Lebesgue Lemma. Perturbation methods: regular and singular perturbation for differential equations, multiple scale analysis, boundary layer theory, WKB theory.

Prerequisites: MATH 3057 and at least one of MATH 3008 and MATH 3705, or permission of the School.

MATH 5605 [0.5 credit] (MAT 5165)

**Theory of Automata**

Algebraic structure of sequential machines, decomposition of machines; finite automata, formal languages; complexity. Also offered, with different requirements, as MATH 4805/COMP 4805 for which additional credit is precluded.

Prerequisite: MATH 2100 or permission of the School.

MATH 5607 [0.5 credit] (MAT 5324)

**Game Theory**

Two-person zero-sum games; infinite games; multi-stage games; differential games; utility theory; two-person general-sum games; bargaining problem;  $n$ -person games; games with a continuum of players. Also offered, with different requirements, as MATH 4807 for which additional credit is precluded.

Prerequisite: MATH 3001 or permission of the School.

MATH 5609 [0.5 credit] (MAT 5301)

**Topics in Combinatorial Mathematics**

Prerequisite: permission of the School.

MATH 5801 [0.5 credit] (MAT 5303)

**Linear Optimization**

Linear programming problems; simplex method, upper bounded variables, free variables; duality; postoptimality analysis; linear programs having special structures; integer programming problems; unimodularity; knapsack problem.

Prerequisite: course in linear algebra and permission of the School.

MATH 5802 [0.5 credit] (MAT 5325)

**Introduction to Information and Systems Science**

Introduction to the process of applying computers in problem solving. Emphasis on the design and analysis of efficient computer algorithms for large, complex problems. Applications: data manipulation, databases, computer networks, queuing systems, optimization. (Also listed as SYSC 5802, COMP 5802 and ISYS 5802.)

MATH 5803 [0.5 credit] (MAT 5304)

**Nonlinear Optimization**

Methods for unconstrained and constrained optimization problems; Kuhn-Tucker conditions; penalty functions; duality; quadratic programming; geometric programming; separable programming; integer nonlinear programming; pseudo-Boolean programming; dynamic programming.

Prerequisite: permission of the School.

MATH 5804 [0.5 credit] (MAT 5307)

**Topics in Operations Research**



MATH 5805 [0.5 credit] (MAT 5308)

**Topics in Algorithm Design**

MATH 5806 [0.5 credit] (MAT 5180)

**Numerical Analysis**

Error analysis for fixed and floating point arithmetic; systems of linear equations; eigen-value problems; sparse matrices; interpolation and approximation, including Fourier approximation; numerical solution of ordinary and partial differential equations. Prerequisite: permission of the School.

MATH 5807 [0.5 credit] (MAT 5167)

**Formal Language and Syntax Analysis**

Computability, unsolvable and NP-hard problems. Formal languages, classes of language automata. Principles of compiler design, syntax analysis, parsing (top-down, bottom-up), ambiguity, operator precedence, automatic construction of efficient parsers, LR, LR(O), LR(k), SLR, LL(k). Syntax directed translation. (Also listed as COMP 5807.) Prerequisites: MATH 5605 or MATH 4805 or COMP 3002, or permission of the School.

MATH 5808 [0.5 credit] (MAT 5305)

**Combinatorial Optimization I**

Network flow theory and related material. Topics will include shortest paths, minimum spanning trees, maximum flows, minimum cost flows. Optimal matching in bipartite graphs. Prerequisite: permission of the School.

MATH 5809 [0.5 credit] (MAT 5306)

**Combinatorial Optimization II**

Topics include optimal matching in non-bipartite graphs, Euler tours and the Chinese Postman problem. Other extensions of network flows: dynamic flows, multicommodity flows, and flows with gains, bottleneck problems. Matroid optimization. Enumerative and heuristic algorithms for the Traveling Salesman and other "hard" problems. Prerequisite: MATH 5808.

MATH 5818 [0.5 credit] (MAT 5105)

**Discrete Applied Mathematics I: Graph Theory**

Paths and cycles, trees, connectivity, Euler tours and Hamilton cycles, edge colouring, independent sets and cliques, vertex colouring, planar graphs, directed graphs. Selected topics from one or more of the following areas: algebraic graph theory, topological graph theory, random graphs. Prerequisite: MATH 3855 or permission of the School.

MATH 5819 [0.5 credit] (MAT 5107)

**Discrete Applied Mathematics II: Combinatorial Enumeration**

Ordinary and exponential generating functions, product formulas, permutations, rooted trees, cycle index, WZ method. Lagrange inversions, singularity analysis of generating functions and asymptotics. Selected topics from one or more of the following areas: random graphs, random combinatorial structures, hypergeometric functions. Prerequisite: MATH 3855 or permission of the School.

MATH 5821 [0.5 credit] (MAT 5341)

**Quantum Computing**

Space of quantum bits; entanglement. Observables in quantum mechanics. Density matrix and Schmidt decomposition. Quantum cryptography. Classical and quantum logic gates. Quantum Fourier transform. Shor's quantum algorithm for factorization of integers. Also offered at the undergraduate level, with different requirements, as MATH 4821, for which additional credit is precluded. Prerequisite: MATH 1102, or permission of the School.

MATH 5822 [0.5 credit] (MAT 5343)

**Mathematical Aspects of Wavelets and Digital Signal Processing**

Lossless compression methods. Discrete Fourier transform and Fourier-based compression methods. JPEG and MPEG. Wavelet analysis. Digital filters and discrete wavelet transform. Daubechies wavelets. Wavelet compression. Also offered, with different requirements, as MATH 4822, for which additional credit is precluded. Prerequisites: Linear algebra and Fourier series, or permission of the School.

MATH 5900 [0.5 credit] (MAT 5990)

**Seminar**

MATH 5901 [0.5 credit] (MAT 5991)

**Directed Studies**

MATH 5903 [0.5 credit]

**Project**

Intended for students registered in Information and Systems Science and M.C.S. programs. Students pursuing the non-thesis option will conduct a study, analysis, and/or design project. Results will be given in the form of a typewritten report and oral presentation.

MATH 5906 [0.5 credit] (MAT 5993)

**Research Internship**

This course affords students the opportunity to undertake research in mathematics as a cooperative project with governmental or industrial sponsors. The grade will be based upon the mathematical content and upon oral and written presentation of results. Prerequisite: permission of the Institute.

MATH 5908 [1.5 credits]

**M.Sc. Thesis in Information and Systems Science**  
(Also listed as COMP 5908, ISYS 5908, SYSC 5908.)

MATH 5909

**M.Sc. Thesis**

MATH 5910 [1.0 credit] (MAT 6097)

**Project in Mathematics and Statistics**

Project in mathematics and statistics supervised by a professor approved by the graduate director resulting in a major report (approximately 30-40 pages). Graded by the supervisor and another professor appointed by the graduate director. The project will normally be completed in one term.

Precludes additional credit for MATH 5909.

Prerequisite: approval of the graduate director.

MATH 6002 [0.5 credit] (MAT 5309)

**Harmonic Analysis on Groups**

Transformation groups; Haar measure; unitary representations of locally compact groups; completeness and compact groups; character theory; decomposition.

MATH 6008 [0.5 credit] (MAT 5326)

**Topics in Analysis**

MATH 6009 [0.5 credit] (MAT 5329)

**Topics in Analysis**

MATH 6101 [0.5 credit] (MAT 5327)

**Topics in Algebra**

MATH 6102 [0.5 credit] (MAT 5330)

**Topics in Algebra**

MATH 6103 [0.5 credit] (MAT 5331)

**Topics in Algebra**

MATH 6104 [0.5 credit] (MAT 5158)

**Lie Groups**

Matrix groups: one-parameter groups, exponential map, Campbell-Hausdorff formula, Lie algebra of a matrix group, integration on matrix groups. Abstract

## Graduate Courses - Mathematics (MATH)

Lie groups.

Prerequisites: MATH 5007 and PADM 5107 or permission of the School.

MATH 6201 [0.5 credit] (MAT 5312)

**Topics in Topology**

MATH 6507 [0.5 credit] (MAT 5313)

**Topics in Probability and Statistics**

MATH 6508 [0.5 credit] (MAT 5314)

**Topics in Probability and Statistics**

MATH 6806 [0.5 credit] (MAT 5361)

**Topics in Mathematical Logic**

MATH 6807 [0.5 credit] (MAT 5162)

**Mathematical Foundations of Computer Science**

Foundations of functional languages, lambda calculi (typed, polymorphically typed, untyped), Curry-Howard Isomorphism, proofs-as-programs, normalization and rewriting theory, operational semantics, type assignment, introduction to denotational semantics of programs, fixed-point programming.

Prerequisites: honours undergraduate algebra and either topology or analysis, permission of the instructor or some acquaintance with logic.

MATH 6900 [0.5 credit] (MAT 6990)

**Seminar**

MATH 6901 [0.5 credit] (MAT 6991)

**Directed Studies**

MATH 6909

**Ph.D. Thesis**

## Mechanical Engineering (MECH)

### Department of Mechanical and Aerospace Engineering

MECH 5000 [0.5 credit] (MCG 5300)

#### Fundamentals of Fluid Dynamics

Differential equations of motion. Viscous and inviscid regions. Potential flow: superposition; thin airfoils; finite wings; compressibility corrections. Viscous flow: thin shear layer approximation; laminar layers; transition; turbulence modeling. Convective heat transfer: free versus forced convection; energy and energy integral equations; turbulent diffusion. Also offered at the undergraduate level, with different requirements, as AERO 4302, for which additional credit is precluded.

MECH 5001 [0.5 credit] (MCG 5301)

#### Theory of Viscous Flows

Navier-Stokes and boundary layer equations; mean flow equations for turbulent kinetic energy; integral formulations. Stability, transition, turbulence, Reynolds stresses; separation. Calculation methods, closure schemes. Compressibility, heat transfer, and three-dimensional effects.

MECH 5003 [0.5 credit] (MCG 5303)

#### Incompressible Non-Viscous Flow

The fundamental equations and theorems for non-viscous fluid flow; solution of two-dimensional and axisymmetric potential flows; low-speed airfoil and cascade theory; wing lifting-line theory; panel methods.

MECH 5004 [0.5 credit] (MCG 5304)

#### Compressible Non-Viscous Flow

Steady isentropic, frictional, and diabatic flow; shock waves; irrotational compressible flow, small perturbation theory and similarity rules; second-order theory and unsteady, one-dimensional flow.

MECH 5008 [0.5 credit] (MCG 5308)

#### Experimental Methods in Fluid Mechanics

Fundamentals of techniques of simulation of fluid dynamic phenomena. Theoretical basis, principles of design, performance and instrumentation of ground test facilities. Applications to aerodynamic testing.

MECH 5009 [0.5 credit] (MCG 5309)

#### Environmental Fluid Mechanics Relating to Energy Utilization

Characteristics of energy sources and emissions into the environment. The atmosphere; stratification and stability, equations of motion, simple winds, mean flow, turbulence structure and dispersion near the ground. Flow and dispersion in groundwater, rivers, lakes and oceans. Physical and analytical modeling of environmental flows.

MECH 5100 [0.5 credit] (MCG 5310)

#### Performance and Economics of Aircraft

Aircraft performance analysis with emphasis on factors affecting take-off, landing and economic performance; high lift schemes; operating economics.

MECH 5101 [0.5 credit] (MCG 5311)

#### Dynamics and Aerodynamics of Flight

Static stability theory. Euler's equations for rigid body motion; the linearized equations of motion; stability derivatives and their estimation. Longitudinal and lateral dynamic response of an aircraft to control and disturbance. Also offered at the undergraduate level, with different requirements, as AERO 4308, for which additional credit is precluded.

MECH 5104 [0.5 credit] (MCG 5314)

#### Ground Transportation Systems and Vehicles

Performance characteristics, handling and directional stability, ride comfort and safety of various types of ground vehicle systems including road vehicles, terrain-vehicle systems, guided transport systems, and advanced ground transport technology.

MECH 5105 [0.5 credit] (MCG 5315)

#### Orbital Mechanics and Space Control

Orbital dynamics and perturbations due to the Earth's figure, the sun, and the moon with emphasis on mission planning and analysis. Rigid body dynamics applied to transfer orbit and on-orbit momentum management and control of spacecraft. Effects of flexible structures on a spacecraft control system.

MECH 5106 [0.5 credit] (MCG 5121)

#### Space Mission Analysis and Design

Review of solar system and space exploration. Space mission design and geometry. Analysis of orbit design, transfers, interplanetary trajectories. Effect of environment on spacecraft design. Space propulsion and launch vehicle design. Launch sequence, windows, cost. Reusable launch systems. Also offered at the undergraduate level, with different requirements, as AERO 4802.

Precludes additional credit for MAAE 4906 (Section B) if taken between 1994-1995 and 2003-2004 inclusive, MECH 5805 taken between 2002-2003 and 2003-2004 inclusive, MAAE 5700 (Section L) taken between 1994-1995 and 1996-1997 inclusive, and MAAE 5805 taken between 1999-2000 and 2001-2002 inclusive.

MECH 5107 [0.5 credit] (MCG 5317)

#### Experimental Stress Analysis

Introduction to theory of elasticity. Photo-elasticity: types of polariscopes, two- and three-dimensional stress fields, frozen patterns. Photoelastic coatings. Strain gauges; gauge factors, sensitivity, calibration, and temperature compensation. Moire fringes, brittle lacquers, mechanical strain gauges.

MECH 5201 [0.5 credit] (MCG 5321)

#### Methods of Energy Conversion

Technical, economic and environmental aspects of present and proposed large-scale systems of energy conversion.

MECH 5202 [0.5 credit] (MCG 5122)

#### Smart Structures

Structural dynamics principles: modal analysis and wave propagation. Linear time invariant systems: feedback, feedforward, SISO, MIMO, digital and adaptive filters. 'Smart' Structures: multifunctional materials, collocation principles, geometric filtering, and control authority. Applications in aero-acoustics and aeroelasticity.

Precludes additional credit for MECH 5807 (if taken 2001-2002 to 2003-2004).

MECH 5300 [0.5 credit] (MCG 5330)

#### Engineering Acoustics

Review of acoustic waves in compressible fluids; acoustic pressure, intensity and impedance; physical interpretation and measurement; transmission through media; layers, in-homogeneous media, solids; acoustic systems; rooms, ducts, resonators, mufflers, properties of transducers; microphones, loudspeakers, computational acoustics.

MECH 5301 [0.5 credit] (MCG 5331)

#### Aeroacoustics

The convected wave equation; theory of subsonic and supersonic jet noise; propeller and helicopter noise; fan and compressor noise; boundary layer noise, interior noise; propagation in the atmosphere; sonic boom; impact on environment.

MECH 5302 [0.5 credit] (MCG 5332)

**Instrumentation Techniques**

An introduction for the non-specialists to the concepts of digital and analog electronics with emphasis on data acquisition, processing and analysis. Topics covered include operational amplifiers, signal processing, digital logic systems, computer interfacing, noise in electronic systems. Hands-on sessions illustrate theory and practice.

MECH 5304 [0.5 credit] (MCG 5334)

**Computational Fluid Dynamics of Compressible Flows**

Solution techniques for parabolic, elliptic and hyperbolic equations developed for problems of interest to fluid dynamics with appropriate stability considerations. A staged approach to solution of full Euler and Navier-Stokes equations is used. Grid generation techniques appropriate for compressible flows are introduced.

MECH 5400 [0.5 credit] (MCG 5344)

**Gas Turbine Combustion**

Combustion fundamentals and gas turbine combustor design. Combustion fundamentals include fuel evaporation, chemistry of combustion, chemical kinetics and emissions formation and introduction to computational combustion modelling. Combustor design addresses the interrelationship between operational requirements and combustion fundamentals.

Precludes additional credit for MECH 5800 (MCG 5480) when MECH 5800 was offered with this topic.

MECH 5401 [0.5 credit] (MCG 5341)

**Turbomachinery**

Types of machines. Similarity: performance parameters; characteristics; cavitation. Velocity triangles. Euler equation: impulse and reaction. Radial pumps and compressors: analysis, design and operation. Axial pumps and compressors: cascade and blade-element methods; staging; off-design performance; stall and surge. Axial turbines. Current design practice.

MECH 5402 [0.5 credit] (MCG 5342)

**Gas Turbines**

Interrelationship among thermodynamic, aerodynamic, and mechanical design. Ideal and real cycle calculations. Cycle optimization; turbo-shaft, turbojet, turbofan. Component performance. Off-design performance; matching of compressor, turbine, nozzle. Twin-spool matching.

MECH 5403 [0.5 credit] (MCG 5343)

**Advanced Thermodynamics**

The course covers three major topics: review of fundamentals from a consistent viewpoint, properties and equations of state, and applications and special topics. The third topic includes an introduction to statistical thermodynamics.

MECH 5407 [0.5 credit] (MCG 5347)

**Conductive and Radiative Heat Transfer**

Analytical, numerical and analog solutions to steady-state and transient conduction heat transfer in multi-dimensional systems. Radiative heat exchange between black, grey, non-grey diffusive and specular surfaces, including effects of athermanous media.

MECH 5408 [0.5 credit] (MCG 5348)

**Convective Heat and Mass Transfer**

Analogies between heat, mass and momentum transfer. Forced and free convection relations for laminar and turbulent flows analytically developed where possible and otherwise deduced from experimental results, for simple shapes and in heat exchangers. Mass transfer theory and applications.

MECH 5500 [0.5 credit] (MCG 5350)

**Advanced Vibration Analysis**

General theory of continuous and discrete multi-degree-of-freedom vibrating systems. Emphasis on numerical techniques of solving complex vibrating systems, with selected applications from aerospace, civil, and mechanical engineering.

MECH 5501 [0.5 credit] (MCG 5125)

**Advanced Dynamics**

Developing and applying the governing equations of motion for discrete and continuous mechanical systems. Includes Newton-Euler and Lagrangian formulations; classical and finite element approaches for continuous systems; and linear stability, frequency response, and propagation solution methods.

Precludes additional credit for MECH 5500 (if taken 2001-2002, 2002-2003).

MECH 5502 [0.5 credit] (MCG 5352)

**Optimal Control Systems**

Review of transfer function and state-space system descriptions. Elements of the optimal control problem. Variational calculus. Optimal state feedback control. Riccati equations. Optimal observers and Kalman-Bucy Filters. Extension to discrete time systems including an introduction to dynamic programming. Practical applications are emphasized throughout the course.

MECH 5503 [0.5 credit] (MCG 5353)

**Robotics**

The history of and introduction to robotics methodology. Robots and manipulators; homogeneous transformation, kinematic equations, solving kinematic equations, differential relationships, motion trajectories, dynamics. Control; feedback control, compliance, servomotors, actuators, external and internal sensors, grippers and vision systems. Microprocessors and their application to robot control. Programming.

MECH 5504 [0.5 credit] (MCG 5354)

**Guidance, Navigation and Control**

Guidance system classification, flight control systems, targeting, target tracking, sensing. Modern multivariable control analysis; design requirements, sensitivity, robustness, perturbations, performance analysis. Modern filtering and estimation techniques. Terrestrial navigation; tactical air navigation (TACAN), star trackers Guidance mission and performance. Aircraft, missile and spacecraft guidance and control.

MECH 5505 [0.5 credit] (MCG 5355)

**Stability Theory and Applications**

Fundamental concepts and characteristics of modern stability definitions. Sensitivity and variational equations; linear variational equations; phase space analysis; Lyapunov's direct method. Autonomous and nonautonomous systems; stability in first approximation; the effect of force type on stability; frequency method.

MECH 5506 [0.5 credit] (MCG 5356)

**Neuro and Fuzzy Control**

Knowledge-based controllers. Fuzzy control: mathematics, relations, operations, approximate reasoning. Fuzzy knowledge base control and structure. Fuzzification, inference engine, defuzzification. Nonlinear, adaptive fuzzy control systems. Stability, Neuro-control: processing, learning. Adaptation of artificial neural systems: associative memories, algorithms, applications, and network implementation. Neurofuzzy systems: industrial applications.

Precludes additional credit for EACJ 5709 (ELG 5196).



MECH 5507 [0.5 credit] (MCG 5124)

**Advanced Kinematics**

Algebraic-geometry applications: kinematic calibration of serial and in-parallel robots; kinematic synthesis of planar, spherical, spatial mechanisms. Various DH-parametrisations, Jacobian formulations. Topics in: projective geometry; Cayley-Klein geometries; Plücker line coordinates; Gröbner bases; Grassmannians; kinematic mapping; Burmester theory. Emphasis on practical applications.

MECH 5601 [0.5 credit] (MCG 5361)

**Creative Problem Solving and Design**

Problem-solving processes and how they can be applied in engineering design. Emphasis on learning methodologies rather than accumulating information. Techniques can be successfully applied in any engineering specialty. (Also listed as IDES 5301.)

MECH 5602 [0.5 credit] (MCG 5362)

**Failure Prevention (Fracture Mechanics and Fatigue)**

Design of engineering structures to ensure against failure due to fatigue or brittle fracture. Nature of fatigue and brittle fracture; selection of suitable material, geometry, and inspection procedures for the load and environmental conditions.

MECH 5603 [0.5 credit] (MCG 5381)

**Lightweight Structures**

Structural behaviour. Fundamentals of basic elasticity. Energy methods of structural analysis. Bending, shear, and torsion of open and closed multicell structures. Bending of plates. Structural idealization and its effects on open and closed sections. Structural stability.

MECH 5604 [0.5 credit] (MCG 5364)

**Computational Metallurgy**

Development of microstructure in alloys in solidification processes and post-solidification processing. Nucleation and growth of solid phase. Formation of a dendrite structure, macro and micro segregations. Pore formation in castings. Thermodynamic and kinetics of phase transformations and structure evolution in solid alloys.

MECH 5605 [0.5 credit] (MCG 5365)

**Finite Element Analysis I**

An introduction to the finite element methodology, with emphasis on applications to heat transfer, fluid flow and stress analysis. The basic concepts of Galerkin's method, interpolation, numerical integration, and isoparametric elements are taught using simple examples.

MECH 5606 [0.5 credit] (MCG 5366)

**Finite Element Analysis II**

Time marching heat flow problems with linear and nonlinear analysis. Static plasticity. Time-dependent deformation problems; viscoplasticity, viscoelasticity, and dynamic analysis. Isoparametric elements and numerical integration are used throughout.

MECH 5607 [0.5 credit] (MCG 5367)

**The Boundary Element Method (BEM)**

Integral equations. The BIE for potential theory and for elastostatics in two-dimensions. Boundary elements and numerical integration schemes. Practical applications.

MECH 5609 [0.5 credit] (MCG 5123)

**Microstructure and Properties of Materials**

Essential microstructural features of metals and alloys: crystal structure, dislocations, grain boundaries. The importance of these features in controlling mechanical properties is emphasized. Analytical techniques observing microstructure in metals and other materials: TEM, SEM, electron diffraction, spectrometry. Precludes additional credit for MECH 5804 (if taken 2002-2003, 2003-2004).

MECH 5700 [0.5 credit] (MCG 5345)

**Surfaces and Coatings**

Surface characteristics of solid materials and surface degradation/failure mechanisms including wear, fretting, oxidation, corrosion, and erosion are introduced. Coating methods including PVD, CVD, laser, thermal spray and electrochemical deposition are discussed in the context of failure prevention measures.

MECH 5701 [0.5 credit] (MCG 5369)

**Metallic Phases & Transformations**

Thermodynamics of crystals, phase diagrams, principles of alloy phases, thermal analysis. Transformation rate and mechanisms. Short and long range diffusional transformations, diffusionless transformations. Phase transformations in engineering systems. Precludes additional credit for MECH 5608 if taken during 2001-2002 or during 2005-2006. Prerequisite: MECH 2700 or the equivalent.

MECH 5704 [0.5 credit] (MCG 5374)

**Integrated Manufacturing Systems (CIMS)**

Topics essential to CIMS including computer graphics, geometric modeling, numerically controlled machining, and flexible manufacturing. The fundamental data structures and procedures for computerization of engineering design, analysis and production. Also offered at the undergraduate level, with different requirements, as MECH 4704, for which additional credit is precluded.

MECH 5705 [0.5 credit] (MCG 5375)

**CAD/CAM**

Computer aided design and manufacturing methodology through hands-on experience and state-of-the-art software. Topics include mathematical representation, solid modeling, drafting, mechanical assembly, mechanism design and CNC machining. CAD data exchange standards, rapid prototyping, concurrent engineering and design for X are also discussed.

MECH 5800 [0.5 credit] (MCG 5480)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5801 [0.5 credit] (MCG 5489)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5802 [0.5 credit] (MCG 5483)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5803 [0.5 credit] (MCG 5488)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5804 [0.5 credit] (MCG 5384)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

Graduate Courses - Mechanical Engineering (MECH)

MECH 5805 [0.5 credit] (MCG 5482)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5806 [0.5 credit] (MCG 5486)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5807 [0.5 credit] (MCG 5387I)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5808 [0.5 credit] (MCG 5376)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5809 [0.5 credit] (MCG 5382)

**Special Topics in Mechanical and Aerospace Engineering**

Topic will vary from year to year.

MECH 5906 [0.5 credit] (MCG 5395)

**Directed Studies**

MECH 5908 [1.5 credits] (MCG 5398)

**Independent Engineering Study**

Students pursuing a master's degree by course work carry out an independent study, analysis, and solution of an engineering problem or design project. The results are given in the form of a written report and presented at a departmental seminar. Carried out under the general direction of a faculty member.

MECH 5909 [2.5 credits]

**M.A.Sc. Thesis**

MECH 6909 [8.5 credits]

**Ph.D. Thesis**

## Music (MUSI)

### School for Studies in Art and Culture

MUSI 5000 [0.5 credit]

#### **Music and Cultural Theory I: Intellectual Histories**

The research process, including the phases of conceptualization, gathering of sources, and writing up the completed research. Topics include: issues related to applying interdisciplinary methodologies to musical objects of study, conducting ethnographic research and writing for scholarly publications, conference presentations, and grant applications. Precludes additional credit for MUSI 5001 (no longer offered).

MUSI 5002 [0.5 credit]

#### **Research Methods in Music and Culture**

The research process, including the phases of conceptualization, gathering of sources, and writing up the completed research. Topics include: issues related to applying interdisciplinary methodologies to musical objects of study, conducting ethnographic research and writing for scholarly publications, conference presentations, and grant applications..

MUSI 5004 [0.5 credit]

#### **Music and Cultural Theory II: Current Debates**

Selected debates within contemporary theory and culture and their relevance to music. The focus will be on a limited range of debates and issues selected by the instructor for in-depth discussion and analysis. Topics will vary from year to year  
Prerequisite: MUSI 5000 or permission of the School.

MUSI 5006 [0.5 credit]

#### **Music and Identity**

Music as a medium for the construction and maintenance of cultural identities, including the relationship between music and traditional cultures, geography, the nation state, urban subcultures, gender and sexuality, race, class, and ethnicity.

MUSI 5007 [0.5 credit]

#### **Music and Visual Culture**

The relationships between musical and visual cultural, including traditional arts, fine art painting, film, television, and digital gaming and interactive media, and the ways in which meanings are dependent upon the various connections between them.

MUSI 5008 [0.5 credit]

#### **Technologies of Music**

The role that technologies, including musical instruments, notation, sound recording, and digital media, play in the concepts and practices associated with music. Topics include: technology as material culture, technology and musical practices, and the increasing importance of technology in contemporary music and culture.

MUSI 5009 [0.5 credit]

#### **Music, Meaning and Representation**

Theories of meaning and representation as applied to music. Major source traditions and critiques to be considered include: semiotics and structuralism, analytic philosophy, formalism, cognitive theory, and post-structuralism.

MUSI 5010 [0.5 credit]

#### **History of Genres**

Theories of genre, including theories derived from literary theory and film studies, and their application to the history of music. Topics may include relationships between genre and musical style, production and reception, social contexts, markets, and the legitimization and organization of knowledge.

MUSI 5011 [0.5 credit]

#### **Music and Social Institutions**

Historical relationships between music and society, including that of Western art music to sacred and secular institutions; the rise of the cultural industries (sound recording, radio and film); the relationship of science, the arts, and the academy; and state policies of arts funding and multiculturalism.

MUSI 5012 [0.5 credit]

#### **Repertoires, Genres and Canons**

A study of the organizational and hierarchical principles whose role is to differentiate, categorize, and legitimize music making within specific historical and social conditions. Topics may include musical canons and their relationship to issues of class, nationalism, taste cultures, and the development of musicology itself.

MUSI 5013 [0.5 credit]

#### **Music and Performance**

Music as a form of social practice rooted in traditions of performance. The variable, multimodal character of music as understood through theories of performance and gesture drawn from the histories and literatures of music, theatre, and dance (in art, popular, and non-Western forms).

MUSI 5014 [0.5 credit]

#### **History of Canadian Music: Notated and Liturgical Music**

Selected aspects of notated Canadian music from 1600 to the present; liturgical music; social and economic conditions of Canadian musical life; regional studies; individual composers and performers.  
Precludes additional credit for MUSI 5100 (no longer offered).

MUSI 5015 [0.5 credit]

#### **Ethnomusicology of Canadian Traditions**

Issues of anthropological, sociological, and analytical significance are examined in the context of selected developments in folklore and ethnomusicological research on Canadian traditions. Also offered at the undergraduate level, with different requirements, as MUSI 4103, for which additional credit is precluded. Precludes additional credit for MUSI 5101 (no longer offered).

MUSI 5016 [0.5 credit]

#### **Music of Canada's First Peoples**

The context and significance of musical expressions of selected Canadian Aboriginal groups and the contributions of individuals in the creation of music and meaning in First Peoples' communities. Also offered at the undergraduate level, with different requirements, as MUSI 4104, for which additional credit is precluded.  
Precludes additional credit for MUSI 5102 (no longer offered).

MUSI 5200 [0.5 credit]

#### **Special Topics in Music and Cultural Theory**

Selected topics focusing on aspects of music and cultural theory not available in regular program offerings. Topic will vary from year to year.

MUSI 5201 [0.5 credit]

#### **Special Topics in Music Genres**

Selected topics focusing on specific genres of music not available in regular program offerings.  
Topic will vary from year to year.

## Graduate Courses - Music (MUSI)

MUSI 5300 [0.5 credit]

### **Practicum in Music**

Academically informed practical experience in music-specific projects such as music recording, librarianship, concert management, research, multimedia creation at local institutions. A maximum of 1.0 credit of practicum may be used in fulfilment of M.A. requirements.

Prerequisite: permission of the School.

MUSI 5900 [0.5 credit]

### **Directed Readings and Research**

Course designed to permit students to pursue research on topics in music and culture chosen in consultation with a member of the faculty. A maximum of 1.0 credit of directed studies may be used in fulfilment of M.A. requirements.

Prerequisite: permission of the School.

MUSI 5908 [1.0 credit]

### **Research Essay**

MUSI 5909 [2.0 credits]

### **M.A. Thesis**



## Neuroscience (NEUR)

### Department of Neuroscience

NEUR 5100 [1.0 credit]

#### Fundamentals in Neuroscience

A general course covering core neuroscience topics including organization of the nervous system, sensory and motor systems, neuroendocrinology, motivation learning and memory, emotion, attention, and pathology. Course includes attendance of the neuroscience colloquium series. (Also listed as BIOL 5304.)

Precludes additional credit for PSYC 5200.

NEUR 5201 [0.5 credit]

#### Statistics for Neuroscience I

Concepts and applications of basic statistical methods. Power determinations, t-tests, analysis of variance designs, including factorial, within groups, and hierarchical designs, analysis of covariance, and follow-up tests. Extensive use of statistical software. Precludes additional credit for PSYC 5410.

NEUR 5202 [0.5 credit]

#### Statistics for Neuroscience II

Concepts and applications of advanced regression analyses, including multiple regression, hierarchical and polynomial techniques, factor analysis and cluster analysis. Extensive use of statistical software. Precludes additional credit for PSYC 5411.

NEUR 5800 [0.5 credit]

#### Special Topics in Neuroscience

An in depth study of current topics in neuroscience and health. Course content varies yearly and has recently included cognitive neuroscience, neuropharmacology, neurodegeneration, neuroimmunology, behavioural medicine, neurobiology of learning and memory, brain mechanisms of ingestive behaviour and energy balance, and molecular neuroscience. (Also listed as BIOL 6203).

NEUR 5909 [3.0 credits]

#### M.Sc. Thesis

NEUR 6100 [1.0 credit]

#### Advanced Seminar in Neuroscience

A comprehensive pro-seminar series, covering issues ranging from cellular and molecular processes through to neural systems and behaviours as well as psychopathology. Students will also be required to attend the Neuroscience colloquia series as part of this course. (Also listed as BIOL 6305.)

Prerequisite: NEUR5100 or equivalent.

Precludes additional credit for PSYC 6200, PSYC 6202, PSYC 6203, BIOL 6303, BIOL 6306.

NEUR 6200 [1.0 credit]

#### Comprehensive Examination

NEUR 6301 [0.5 credit]

#### Techniques in Neuroscience I

Completion of a research project carried out under the supervision of a neuroscience faculty member, normally not the current supervisor. The student will learn a new neuroscience technique and apply it to a research objective. Students must obtain prior approval from the graduate committee.

Precludes additional credit for PSYC 6204.

NEUR 6302 [0.5 credit]

#### Techniques in Neuroscience II

Completion of a research project carried out under the supervision of a neuroscience faculty member, normally not the current supervisor. The student will learn a new neuroscience technique and apply it to a research objective. Students must obtain prior approval from the graduate committee.

Precludes additional credit for PSYC 6204.

NEUR 6401 [0.5 credit]

#### Independent Research in Neuroscience I

Permission to register and approval of research plan must be obtained from the graduate committee. A final research report must be filed in the departmental office prior to submission of course grade.

Precludes additional credit for PSYC 5901 and PSYC 6901.

NEUR 6402 [0.5 credit]

#### Independent Research in Neuroscience II

Permission to register and approval of research plan must be obtained from the graduate committee. A final research report must be filed in the departmental office prior to submission of course grade.

Precludes additional credit for PSYC 5901 and PSYC 6901.

NEUR 6501 [0.5 credit]

#### Directed Studies in Neuroscience I

In-depth investigation of selected topics in neuroscience by means of directed library research. Registration is restricted, permission to register being granted only by the graduate committee. A final report must be filed in the departmental office prior to submission of course grade.

Precludes additional credit for PSYC 5900 and PSYC 6900.

NEUR 6502 [0.5 credit]

#### Directed Studies in Neuroscience II

In-depth investigation of selected topics in neuroscience by means of directed library research. Registration is restricted, permission to register being granted only by the graduate committee. A final report must be filed in the departmental office prior to submission of course grade.

Precludes additional credit for PSYC 5900 or PSYC 6900.

NEUR 6909 [6.0 credit]

#### Ph.D. Thesis

## Philosophy (PHIL)

### Department of Philosophy

PHIL 5000 [0.5 credit]

#### Special Topic in Philosophy

A detailed study of a special topic in philosophy. Topics may vary from year to year. Also offered at the undergraduate level, with different requirements, as PHIL 4100, for which additional credit is precluded when topics are the same.

PHIL 5004 [0.5 credit]

#### Tutorial in the History of Philosophy I

Detailed study of a period or issue in the history of philosophy.

PHIL 5005 [0.5 credit]

#### Tutorial in the History of Philosophy II

Detailed study of a period or issue in the history of philosophy.

PHIL 5104 [0.5 credit]

#### Tutorial in the Work of an Individual Philosopher I

A critical and systematic study of the work of an individual philosopher.

PHIL 5105 [0.5 credit]

#### Tutorial in the Work of an Individual Philosopher II

A critical and systematic study of the work of an individual philosopher.

PHIL 5204 [0.5 credit]

#### Tutorial in Logic, Epistemology, or Metaphysics I

An attempt to find a solution to a specific problem in logic, epistemology, or metaphysics.

PHIL 5205 [0.5 credit]

#### Tutorial in Logic, Epistemology, or Metaphysics II

An attempt to find a solution to a specific problem in logic, epistemology, or metaphysics.

PHIL 5304 [0.5 credit]

#### Tutorial in Selected Problems of Philosophy I

An attempt to find a solution to a specific problem in some area other than logic, epistemology, or metaphysics.

PHIL 5305 [0.5 credit]

#### Tutorial in Selected Problems of Philosophy II

An attempt to find a solution to a specific problem in some area other than logic, epistemology, or metaphysics.

PHIL 5200 [0.5 credit]

#### Topics in Philosophy of Mind or Philosophy of Language

A detailed study of an issue or the work of selected philosophers in the general area of philosophy of mind and/or philosophy of language. Topics may vary from year to year. Also offered at the undergraduate level, with different requirements, as PHIL 4210 or PHIL 4220, for which additional credit is precluded when topics are the same.

PHIL 5250 [0.5 credit]

#### Topics in Logic, Epistemology, Metaphysics or Philosophy of Science

A detailed study of an issue or the work of selected philosophers in the general areas of logic, epistemology, metaphysics or philosophy of science. Topics may vary from year to year. Also offered at the undergraduate level, with different requirements, as PHIL 4230, for which additional credit is precluded when topics are the same.

PHIL 5300 [0.5 credit]

#### Topics in Value Theory

A detailed study of an issue or the work of selected philosophers in the general area of value theory. Topics may vary from year to year. Also offered at the

undergraduate level, with different requirements, as PHIL 4300, for which additional credit is precluded when topics are the same.

PHIL 5350 [0.5 credit]

#### Topics in Ethics or Political Philosophy

A detailed study of an issue or the work of selected philosophers in the general areas of ethics or political philosophy. Topics may vary from year to year. Also offered at the undergraduate level, with different requirements, as PHIL 4320 or PHIL 4330, for which additional credit is precluded when topics are the same.

PHIL 5500 [0.5 credit]

#### Topics in Contemporary Philosophy

A detailed study of an issue or the work of selected philosophers in contemporary philosophy. Topics may vary from year to year. Also offered at the undergraduate level, with different requirements, as PHIL 4007 or PHIL 4008, for which additional credit is precluded when topics are the same.

PHIL 5600 [0.5 credit]

#### Topics in the History of Philosophy

A detailed study within the history of philosophy: a period, an issue or the work of selected philosophers. Topics may vary from year to year. Also offered at the undergraduate level, with different requirements, as PHIL 4003, PHIL 4004, PHIL 4005, or PHIL 4006, for which additional credit is precluded when topics are the same.

PHIL 5700 [0.5 credit]

#### Fall Colloquium

Students prepare for and attend the departmental colloquium series (typically including 10 to 12 sessions in one term), submitting in writing a critical analysis of some aspect of the presentation or discussion for each colloquium they attend.

PHIL 5750 [0.5 credit]

#### Winter Colloquium

Students prepare for and attend the departmental colloquium series (typically including 10 to 12 events in one term), submitting in writing a critical analysis of some aspect of the presentation or discussion for each colloquium they attend.

PHIL 5850 [0.5 credit]

#### Proseminar

Students in this seminar will engage with contemporary philosophical research by exploring relations and interactions between two broad fields: philosophy of mind, language, and knowledge; and moral, social, and political philosophy. Specific topics will vary from year to year.

PHIL 5900 [0.5 credit]

#### Research Seminar

Students select a contemporary philosophical position or historical interpretation and the surrounding debate in the philosophical or scholarly literature upon which to base a thesis proposal using literature review and an essay.

PHIL 5908 [1.0 credit]

#### Research Essay

PHIL 5909 [2.0 credits]

#### M.A. Thesis

## Physics (PHYS)

### Department of Physics

With the exception of PHYS 5701 (PHY 5170), which may be offered at either Carleton or the University of Ottawa, all PHYS courses are offered only at Carleton, and all PHYJ courses are offered only at the University of Ottawa.

University of Ottawa course numbers (in parentheses) follow the Carleton course number and credit information.

PHYS 5002 [0.5 credit] (PHY 5344)

#### Computational Physics

Computational methods used in analysis of experimental data. Introduction to probability and random variables. Monte Carlo methods for simulation of random processes. Statistical methods for parameter estimation and hypothesis tests. Confidence intervals. Multivariate data classification. Unfolding methods. Examples taken primarily from particle and medical physics. Also offered at the undergraduate level, with different requirements, as PHYS 4807, for which additional credit is precluded. Prerequisite: an ability to program in FORTRAN, Java, C, or C++ or permission of the Department.

PHYS 5101 [0.5 credit] (PHY 8111)

#### Classical Mechanics and Theory of Fields

Hamilton's principle; conservation laws; canonical transformations; Hamilton-Jacobi theory; Lagrangian formulation of classical field theory. Prerequisite: permission of the Department.

PHYS 5201 [0.5 credit]

#### Introduction to Medical Imaging Principles and Technology

Basic principles and technological implementation of x-ray, nuclear medicine, magnetic resonance imaging (MRI), and other imaging modalities used in medicine. Contrast, resolution, storage requirements for digital images. Applications outside of medicine, future trends.

Precludes additional credit for BIOM 5201.

Prerequisite: permission of the Physics Department.

PHYS 5202 [0.5 credit] (PHY 8122)

#### Special Topics in Molecular Spectroscopy

Topics may include: electronic spectra of diatomic and triatomic molecules and their interpretation using molecular orbital diagrams; Raman and resonance Raman spectroscopy; symmetry aspects of vibrational and electronic levels of ions and molecules in solids; the presence of weak and strong resonant laser radiation. (Also listed as CHEM 5009/CHM 8150).

Prerequisite: permission of the Department.

PHYS 5203 [0.5 credit] (PHY 5161)

#### Medical Radiation Physics

Interaction of electromagnetic radiation with matter. Sources: X-ray, accelerators, radionuclide. Charged particle interaction mechanisms, stopping powers, kerma, dose. Introduction to dosimetry. Units, measurements, dosimetry devices.

Prerequisite: permission of the Department.

PHYS 5204 [0.5 credit] (PHY 5112)

#### Physics of Medical Imaging

Physical foundation of and recent developments in transmission X-ray imaging, computerized tomography, nuclear medicine, magnetic resonance imaging, and ultrasound, for the specialist imaging physicist. Image quality, contrast, resolution, SNR, MTF, DQE. Introduction to image processing, system performance assessment.

Prerequisites: PHYS 5203 and PHYS 4203, or permission of the Department.

PHYS 5206 [0.5 credit] (PHY 5164)

#### Medical Radiotherapy Physics

Radiation therapy process and physics. Ion chamber dosimetry, Monte Carlo techniques of radiation transport, cavity theories, external beam therapy, brachytherapy, dosimetry protocols, detectors used in radiation therapy. Treatment planning, monitor unit calculations, intensity-modulated radiation therapy. Novel and alternate techniques.

Prerequisite: PHYS 5203 or permission of the Department.

PHYS 5207 [0.5 credit] (PHY 5165)

#### Radiobiology

Physics and chemistry of radiation interactions. Cell biology, DNA damage and repair, survival curves and models, radiosensitivity, oxygen effect. Linear energy transfer, relative biological effectiveness. Whole body radiation effects, radioprotectors, radiosensitizers. Hyperthermia. Molecular techniques in radiobiology. Model tumour systems.

Prerequisite: PHYS 5203 must have been taken, or be taken concurrently, or permission of the Department.

PHYS 5208 [0.5 credit] (PHY 5163)

#### Radiation Protection

Dose quantities, effects of radiation exposure, fetal risks, scientific basis for protection, dose limits. Background radiation, dose from internal radionuclides. Doses in radiology, incidents in radiation therapy. Shielding design, working with radioactive materials. Instruments and measurement. Radiation protection organizations.

Prerequisite: PHYS 5203 or permission of the Department.

PHYS 5209 [0.5 credit] (PHY 5166)

#### Medical Physics Practicum

Experience with current clinical medical imaging and cancer therapy equipment, and dosimetry and biophysics instrumentation. The course requires completion of experimental projects on medical imaging, radiotherapy, dosimetry, and biophysics, conducted at local clinics and NRC laboratories.

Prerequisites: PHYS 5203. Also, as appropriate to the majority of projects undertaken, one of PHYS 5204, PHYS 5206, PHYS 5207, or other biophysics course, or permission of the Department.

PHYS 5210 [0.0 credit]

#### Anatomy and Physiology for Medical Physicists

An overview of human anatomy and physiology as background for the application of physics to cancer therapy and medical imaging. Anatomy as depicted by imaging technologies such as CT, MRI, and radiography will be emphasized. Graded *Sat/Uns*.

Prerequisite: enrollment in the graduate program in medical physics or permission of the Department.

PHYS 5291 [0.5 credit] (PHY 5167)

#### Advanced Topics in Medical Physics

Topics may include medical imaging physics, cancer therapy physics, medical biophysics, or radiation protection and health physics.

Prerequisites: PHYS 5203 plus, as appropriate to the particular advanced topic offered, at least one of PHYS 5204, PHYS 5206, PHYS 5207; or permission of the Department.

PHYS 5302 [0.5 credit] (PHY 8132)

#### Classical Electrodynamics

Covariant formulation of electrodynamics; Lenard-Wiechert potentials; radiation reaction; plasma physics; dispersion relations.

Prerequisite: PHYS 4307 or equivalent, or permission of the Department.



Graduate Courses - Physics (PHYS, PHYJ)

PHYS 5318 [0.5 credit] (PHY 5318)

**Modern Optics**

Electromagnetic wave propagation; reflection, refraction; Gaussian beams; guided waves. Laser theory: stimulated emission, cavity optics, gain and bandwidth, atomic and molecular lasers. Mode locking, Q switching. Diffraction theory, coherence, Fourier optics, holography, laser applications. Optical communication systems, nonlinear effects: devices, fibre sensors, integrated optics.

Also offered at the undergraduate level, with different requirements, as PHYS 4208 for which additional credit is precluded.

Prerequisite: permission of the Department.

PHYS 5601 [0.5 credit] (PHY 5966)

**Experimental Techniques of Nuclear and Elementary Particle Physics**

The interaction of radiation and high energy particles with matter; experimental methods of detection and acceleration of particles; use of relativistic kinematics; counting statistics.

Prerequisites: PHYS 4307 or equivalent, and PHYS 4707; or permission of the Department.

PHYS 5602 [0.5 credit] (PHY 5967)

**Physics of Elementary Particles**

Properties of leptons, quarks, and hadrons. The fundamental interactions. Conservation laws; invariance principles and quantum numbers. Resonances observed in hadron-hadron interactions. Three body phase space. Dalitz plot. Quark model of hadrons, mass formulae. Weak interactions; parity violation, decay of neutral kaons; CP violation; Cabibbo theory. Also offered at the undergraduate level, with different requirements, as PHYS 4602, for which additional credit is precluded.

Prerequisite: PHYS 4707 or permission of the Department.

PHYS 5604 [0.5 credit] (PHY 8164)

**Intermediate Nuclear Physics**

Properties of the deuteron and the neutron-proton force. Nucleon-nucleon forces, isospin and charge independence. Nuclear models. Scattering theory. Interpretation of n-p and p-p scattering experiments. Interaction of nucleons with electrons. Interaction of nuclei with radiation.

Prerequisite: PHYS 4608 or permission of the Department.

PHYS 5701 [0.5 credit] (PHY 5170)

**Intermediate Quantum Mechanics with Applications**

Angular momentum and rotation operations; Wigner and Racah coefficients; several and many electron problem in atoms; variational and Hartree-Fock formalism; introduction to second quantized field theory; scattering theory.

Prerequisites: PHYS 4707 and PHYS 4708 or permission of the Department.

PHYS 5702 [0.5 credit] (PHY 8172)

**Relativistic Quantum Mechanics**

Relativistic wave equations. Expansion of S matrix in Feynman perturbation series. Feynman rules. An introduction to quantum electro-dynamics with some second quantization. Gauge theories. May include introduction to Standard Model.

Prerequisite: PHYS 5701 and permission of the Department.

PHYS 5801 [0.5 credit] (PHY 5140)

**Methods of Theoretical Physics I**

This course and PHYS 5802 are designed for students who wish to acquire a wide background of mathematical techniques. Topics can include complex variables, evaluation of integrals, approximation techniques, dispersion relations, Padé approximants, boundary value problems, Green's functions, integral equations.

PHYS 5802 [0.5 credit] (PHY 5141)

**Methods of Theoretical Physics II**

This course complements PHYS 5801. Topics include group theory, discussion of SU<sub>2</sub>, SU<sub>3</sub>, and other symmetry groups. Lorentz group.

PHYS 5900 [1.0 credit] (PHY 8290)

**Selected Topics in Physics (M.Sc.)**

A student may, with the permission of the Department, take more than one selected topic, in which case each full course is counted for credit.

Prerequisite: permission of the Department.

PHYS 5901 [0.5 credit] (PHY 8191)

**Selected Topics in Physics (M.Sc.)**

Prerequisite: permission of the Department.

PHYS 5905 [1.0 credit] (PHY 5495)

**Physics in Modern Technology Work Term**

Experience for students enrolled in the physics in modern technology stream. To receive course credit, students must receive satisfactory evaluations for their work term employment. Written and oral reports describing the work term project are required.

Prerequisites: Registration in the physics in modern technology stream of the M.Sc. program and permission of the Department.

PHYS 5909 (PHY 7999)

**M.Sc. Thesis**

Prerequisite: permission of the Department.

PHYS 6601 [0.5 credit] (PHY 8165)

**Particle Physics Phenomenology**

This course covers much of the required knowledge for research in particle physics from both the experimental and theoretical points of view. Topics may include: standard model, parton model, quark model, hadron spectroscopy, and tests of QCD.

Prerequisite: PHYS 5602 or permission of the Department.

PHYS 6602 [0.5 credit] (PHY 8166)

**Advanced Topics in Particle Physics**

Phenomenology. This course will consist of a variety of seminars and short lecture courses, and will cover topics of immediate interest to the research program of the department.

Prerequisite: PHYS 6601 or permission of the Department.

PHYS 6701 [0.5 credit] (PHY 8173)

**Quantum Field Theory**

Relativistic quantum field theory; second quantization of Bose and Fermi fields; reduction and LSZ formalism; perturbation expansion and proof of renormalizability of quantum field theories; calculations of radiative corrections and applications.

Prerequisites: PHYS 5701 and PHYS 5702, or permission of the Department.

PHYS 6900 [1.0 credit] (PHY 8490)

**Selected Topics in Physics (Ph.D.)**

Prerequisite: permission of the Department.

PHYS 6901 [0.5 credit] (PHY 8391)

**Selected Topics in Physics (Ph.D.)**

Prerequisite: permission of the Department.



PHYS 6909 (PHY 9999)

**Ph.D. Thesis**

Prerequisite: permission of the Department.

## Physics - PHYJ (PHYJ)

### Department of Physics

With the exception of PHYS 5701 (PHY 5170), which may be offered at either Carleton or the University of Ottawa, all PHYS courses are offered only at Carleton, and all PHYJ courses are offered only at the University of Ottawa.

University of Ottawa course numbers (in parentheses) follow the Carleton course number and credit information.

PHYJ 5001 [0.5 credit] (PHY 5130)

#### **Experimental Characterization Techniques in Materials Science, Physics, Chemistry, and Mineralogy**

Survey of experimental techniques used in materials science, condensed matter physics, solid state chemistry, and mineralogy to characterize materials and solid substances. Diffraction. Spectroscopy.

Microscopy and imaging. Other analytic techniques. Prerequisite: permission of the Department.

PHYJ 5003 [0.5 credit] (PHY 5342)

#### **Computer Simulations in Physics**

Advanced numerical methods to study large scale problems in the natural sciences; molecular dynamics, Langevin dynamics, Brownian dynamics methods. The use of different thermodynamic ensembles to compute experimentally relevant physical properties, and work with non-equilibrium situations. Methods to handle very large problems on parallel computers.

Prerequisite: PHY 3355 (PHY 3755), PHY 3370 (PHY 3770) and familiarity with FORTRAN, Pascal or C.

PHYJ 5004 [0.5 credit] (PHY 5340)

#### **Computational Physics I**

Deterministic numerical methods in physics. Interpolation methods. Numerical solutions of Newton's, Maxwell's and Schrödinger's equations. Molecular dynamics. Non-linear dynamics. Numerical solutions of partial differential equations in physics. Finite elements. This course cannot be combined for credit with PHY 4340 (PHY 4740).

PHYJ 5005 [0.5 credit] (PHY 5341)

#### **Computational Physics II**

Interpolation, regression and modeling. Random number generation. Monte Carlo methods. Simulations in thermo-statistics. Fractals, percolation, cellular automation. Stochastic methods. This course cannot be combined for credit with PHY 4341 (PHY 4741).

PHYJ 5006 [0.5 credit] (PHY 5362)

#### **Computational Methods in Material Sciences**

Introduction to modern computational techniques used in material science research. Classical molecular dynamics, classical and quantum Monte Carlo methods, plane-wave based electronic band structure calculations, Carr-Parrinello quantum molecular dynamics. Applications to condensed matter systems: basic simulation techniques, force-field based methods, first-principles quantum mechanical methods.

Prerequisite: permission of the Department.

PHYJ 5102 [0.5 credit] (PHY 5361)

#### **Nonlinear Dynamics in the Natural Sciences**

Differential and difference equations, Fourier series and data analysis, stability analysis, Poincaré maps, local bifurcations, routes to chaos and statistical properties of strange attractors. Applications of these concepts to specific problems in condensed matter physics, molecular physics, fluid mechanics,

dissipative structures, and evolutionary systems.

Prerequisite: permission of the Department.

PHYJ 5308 [0.5 credit] (PHY 5384)

#### **Physics of Fiber Optic Systems**

Physics of electromagnetic waves in fiber-optic systems. Laser modulation, chirp effects, noise. Amplitude, frequency, phase modulation. Optical dispersion (chromatic dispersion, polarization mode dispersion and polarization-dependent losses). Fibre losses and nonlinear effects. Optical detectors, receivers, signal to noise ratio, power penalties. Overall system design.

PHYJ 5322 [0.5 credit] (PHY 5322)

#### **Biological Physics**

Biological phenomena studied using techniques of physics. Key components of cells. Physical concepts relevant to cellular phenomena: Brownian dynamics, fluids, suspensions, entropy driven phenomena, chemical forces and self-assembly. Biological molecules. Enzymes. Molecular motors. Nerve impulses. Also offered, with different requirements, as PHY 4322.

Precludes additional credit for PHY 4322.

PHYJ 5330 [0.5 credit] (PHY 5330)

#### **Fibre Optics Communications**

Optical fibres: description, modes, losses. optical transmitters: light-emitting diodes, semiconducting lasers. Optical receivers: design, noise, sensitivity, degradation, performance. System design and performance. Optical amplifiers: dispersion management, pre-compensation schemes, post-compensation techniques, dispersion compensating fibres, optical filters, fibre Bragg gratings, soliton generation, long-haul lightwave systems, high-capacity systems.

Precludes additional credit for ELG 5103.

PHYJ 5331 [0.5 credit] (PHY 5331)

#### **Fibre Optics Sensors**

Fundamental properties of optical fibres. Light sources and detectors for optical fibre applications. Fibre optics sensors based on the Mach-Zehnder, Michelson and Fabry-Perot Interferometers, Bragg gratings. signal detection schemes. Distributed sensing and multiplexing. Applications for optical fibre sensors. Temperature and strain measurements.

PHYJ 5332 [0.5 credit] (PHY 5332)

#### **Nonlinear Optics**

Nonlinear optical susceptibility; wave equation description of nonlinear optics processes: second harmonic generation, intensity dependent refractive index, sum- and frequency-generation, parametric amplification; quantum mechanical theory of nonlinear optics; Brillouin and Raman scattering; the electro-optic effect; nonlinear fibre optics and solitons.

PHYJ 5333 [0.5 credit] (PHY 5333)

#### **Mode Locked Lasers**

Concept and realization of mode locking. Mode locked lasers including Q-switch. Ultrafast pulse generation and measurement. Soliton generation: dispersion and self-phase modulation. Applications to science and technology.

PHYJ 5401 [0.5 credit] (PHY 5100)

#### **Solid State Physics I**

Periodic structures, Lattice waves. Electron states. Static properties of solids. Electron-electron interaction. Dynamics of electrons. Transport properties. Optical properties.

Prerequisite: permission of the Department.

PHYJ 5402 [0.5 credit] (PHY 5110)

#### **Solid State Physics II**

Elements of group theory. Band structure, tight

binding and other approximations, Hartree-Fock theory. Measuring the Fermi surface. Boltzmann equation and semiconductors. Diamagnetism, paramagnetism and magnetic ordering. Superconductivity.

Prerequisite: permission of the Department.

PHYJ 5403 [0.5 credit] (PHY 5151)

#### **Type I and II Superconductors**

Flux flow and flux cutting phenomena. Clem general critical state model. Flux quantization, Abrikosov vortex model and Ginzburg-Landau theory. Superconducting tunnelling junctions (Giaever and Josephson types).

Prerequisite: PHY 4370 or permission of the Department.

PHYJ 5404 [0.5 credit] (PHY 6371)

#### **Topics in Mössbauer Spectroscopy**

Recoilless emission/absorption, anisotropic Debye-Waller factors, second order Doppler shifts. Mössbauer lineshape theory with static and dynamic hyperfine interactions. Distributions of static hyperfine parameters. Physics of the hyperfine parameters: origin of the hyperfine field, calculations of electric field gradients. Applications of Mössbauer spectroscopy.

Prerequisite: permission of the Department.

PHYJ 5407 [0.5 credit] (PHY 5380)

#### **Semiconductor Physics I**

Brillouin zones and band theory. E-k diagram, effective mass tensors, etc. Electrical properties of semiconductors. Conduction, hall effect, magneto-resistance. Scattering processes. Multivalley models and non-parabolic bands.

Prerequisite: PHY 4380 or permission of the Department.

PHYJ 5408 [0.5 credit] (PHY 5381, PHY 5781)

#### **Semiconductor Physics II: Optical Properties**

Optical constants and dispersion theory. Optical absorption, reflection and band structure. Absorption at band edge and excitons. Lattice, defect and free carrier absorption, Magneto-optics. Photo-electronic properties, luminescence, detector theory. Experimental methods.

Prerequisite: PHY 4380 or permission of the Department.

PHYJ 5409 [0.5 credit] (PHY 5951)

#### **Low Temperature Physics II**

Helium 3 and Helium 4 cryostats. Dilution refrigerators. Theory and techniques of adiabatic demagnetization. Thermometry at low temperatures. Problems of thermal equilibrium and of thermal isolation. Properties of matter at very low temperature.

Prerequisite: PHY 4355 or permission of the Department.

PHYJ 5502 [0.5 credit] (PHY 5740)

#### **Physique Numérique I**

Méthodes numériques déterministes en physique. Techniques d'interpolation. Solutions numérique des équations de Newton, de Maxwell et de Schrödinger. Dynamique moléculaire. Dynamique non-linéaire. Solutions numériques des équations aux dérivées partielles en physique. Éléments finis.

Prerequisite: permission of the Department.

PHYJ 5503 [0.5 credit] (PHY 5741)

#### **Physique Numérique II**

Interpolation, régression et modeler. Nombres aléatoires. Techniques de Monte-Carlo. Simulations thermo-statistiques. Percolation, fractales, et automatisation cellulaire. Méthodes numériques stochastiques.

Prerequisite: permission of the Department.

PHYJ 5504 [0.5 credit] (PHY 5387)

#### **Physics of Materials**

Microscopic characteristics related to the physical properties of materials. Materials families: metals and alloys, ceramics, polymers and plastics, composites, layered materials, ionic solids, molecular solids, etc. Specific materials groups. Equilibrium phase diagrams and their relation to microstructure and kinetics. Experimental methods of characterization. Interactions and reactions.

Prerequisite: PHY 4382 or equivalent. Cannot be combined with PHY 4387.

PHYJ 5505 [0.5 credit] (PHY 5355)

#### **Statistical Mechanics**

Ensemble theory. Interacting classical and quantum systems. Phase transitions and critical phenomena. Fluctuations and linear response theory. Kinetic equations.

Prerequisites: PHY 4370 and PHY 3355 or permission of the Department.

PHYJ 5506 [0.5 credit] (PHY 5742)

#### **Simulations numériques en physique**

Un cours ayant but d'étudier des méthodes numériques avancées employées dans les problèmes à grande échelle dans les sciences naturelles. Emploi d'ensembles thermo-dynamiques différents, calculs de propriétés physiques expérimentalement pertinentes, et extension aux situations hors d'équilibre. Techniques pour ordinateurs parallèles.

Prerequisite: permission of the Department.

PHYJ 5507 [0.5 credit] (PHY 5922)

#### **Advanced Magnetism**

Study of some experimental and theoretical aspects of magnetic phenomena found in ferro-, ferri-, antiferromagnetic and spin glass materials. Topics of current interest in magnetism.

Prerequisite: PHY 4385 and permission of the Department.

PHYJ 5508 [0.5 credit] (PHY 5320)

#### **Introduction to the Physics of Macromolecules**

Chemistry of macromolecules and polymers; random walks and the static properties of polymers; experimental methods; the Rouse model and single chain dynamics; polymer melts and viscoelasticity; the Flory-Huggins theory; the reptation theory; computer simulation algorithms; biopolymers and copolymers.

Prerequisite: permission of the Department.

PHYJ 5509 [0.5 credit] (PHY 5347)

#### **Physics, Chemistry and Characterization of Mineral Systems**

The materials science of mineral systems such as the network and layered silicates. In-depth study of the relations between mineralogically relevant variables such as: atomic structure, crystal chemistry, site populations, valence state populations, crystallization conditions. Interpretation and basic understanding of characterization tools.

Prerequisite: permission of the Department.

PHYJ 5703 [0.5 credit] (PHY 6170)

#### **Advanced Quantum Mechanics II**

Systems of identical particles and many-body theory. Lattice and impurity scattering. Quantum processes in a magnetic field. Radiative and non-radiative transitions. Introduction to relativistic quantum mechanics.

Prerequisite: PHY 5170 and permission of the Department.

PHYJ 5722 [0.5 credit] (PHY 5722)

**Physique Biologique**

Application des méthodes de la physique à l'étude des phénomènes biologiques. Composantes principales d'une cellule. Concepts physiques pertinents aux phénomènes cellulaires : dynamique brownienne, liquides, suspensions, phénomènes d'origine entropique, forces chimiques et auto-assemblage. Molécules biologiques. Enzymes. Moteurs moléculaires. Impulsions nerveuses. Offert également, avec des exigences différentes, sous la cote PHY 4722. Precludes additional credit for PHY 4722.

PHYJ 6406 [0.5 credit] (PHY 6382)

**Physics of Semiconductor Superlattices**

Fundamental physics of two-dimensional quantized semiconductor structures. Electronic and optical properties of superlattices and quantum wells. Optical and electronic applications. This course is intended for students registered for the Ph.D. in semiconductor physics research. Prerequisite: advanced undergraduate or graduate course in solid state physics and permission of the Department.

PHYJ 6407 [0.5 credit] (PHY 6782)

**Physique des super-réseaux à semi-conducteurs**

Physique fondamentale des structures quantiques bi-dimensionnelles à semi-conducteurs. Propriétés électroniques et optiques des super-réseaux et puits quantiques. Applications à l'électronique et à l'optique. Ce cours est destiné aux étudiants et aux étudiantes inscrits au doctorat en physique des semi-conducteurs. Prerequisite: permission of the Department.

## Political Economy (PECO)

### Institute of Political Economy

PECO 5000 [0.5 credit]

#### Theories of Political Economy

A survey of the core concepts and ideas proposed by both the founders and modern practitioners of political economy. Particular attention will be paid to contemporary theorists and classical theorists such as Smith, Ricardo, Marx, Mill, Schumpeter, Keynes, Veblen, and Innis.

PECO 5001 [0.5 credit]

#### The Methodology of Political Economy

An examination of the methods, procedures, and rules for developing theory and guiding inquiry in political economy research, including topics such as logic of inquiry, conceptualization, research design, dialectics, level of analysis, comparison, evidence and statistics.

PECO 5501 [0.5 credit]

#### Selected Problems in Political Economy I

(Also listed as SOCI 5504 and PSCI 5501.)

PECO 5502 [0.5 credit]

#### Selected Problems in Political Economy II

(Also listed as SOCI 5505 and PSCI 5502.)

PECO 5900 [0.5 credit]

#### Tutorial in Political Economy

Directed readings on selected aspects of political economy, involving preparation of papers as the basis for discussion with the tutor. Offered when no regular course offering meets a candidate's specific needs. Prerequisite: permission of the Director.

PECO 5907 [0.5 credit]

#### Placement in Political Economy

This course offers an opportunity to earn academic credit by engaging in research activities under the supervision of professional researchers in the community. Placement possibilities may be initiated by the student or arranged through community contacts established by the Institute of Political Economy. Course normally to be taken once only. Prerequisite: permission of the Director.

PECO 5908 [1.0 credit]

#### Research Essay

Directly linked to the student's course work, the research essay must be interdisciplinary in approach.

PECO 5909 [2.0 credits]

#### M.A. Thesis

The thesis is an alternative to the research essay. It must also be interdisciplinary in approach, and requires greater substance and originality than the Research Essay. Normally, a student's thesis committee will be composed of members from more than one discipline.

PECO 6000 [0.5 credit]

#### Political Economy: Core Concepts

Core concepts in political economy, drawn from classical and contemporary writings. Topics will be selected in consultation with participating units, taking into account the potential number of students, their research interests and those of the participating units.

## Political Management (POLM)

### Arthur Kroeger College of Public Affairs

POLM 5001 [0.5 credit]

#### Institutions and Governance I

A critical introduction to how political power is exercised in Canada and how that pertains to political management.

POLM 5002 [0.5 credit]

#### Institutions and Governance II

How public policy originates, how it is shaped through the political, federal-provincial, bureaucratic and parliamentary processes, and how it can be managed to turn an idea into legislation, building support for its adoption and then implementation after legislation has been passed. Prerequisite: POLM 5001.

POLM 5003 [0.5 credit]

#### Strategic Communications I

An exploration of the range of issues involved in formulating and implementing successful political strategic communications.

POLM 5004 [0.5 credit]

#### Strategic Communications II

Developing messages and a communications approach around a policy or legislative measure, using consultation and public opinion research, the role of the traditional and new digital/social media in the process, how to deal with interest groups and how to address crises. Prerequisite: POLM 5003.

POLM 5005 [0.5 credit]

#### Political Management I

The theory and practice of political management in Canada, ranging from ethical behaviour to relations between political staff and public servants, political parties, parliament, caucus, cabinet and the public.

POLM 5006 [0.5 credit]

#### Political Management II

Practical human and administrative challenges of the profession, such as managing a political office, managing a campaign, and establishing priorities in the face of a constantly changing array of political and public pressures. Prerequisite: POLM 5005.

POLM 5010 [0.5 credit]

#### Polling and Opinion Research

The different elements of polling such as questionnaire design, sampling design, interviewing, data analysis and interpretation and how this helps understand the process by which citizens make decisions about political issues.

POLM 5011 [0.5 credit]

#### Political Campaigns

The latest trends and innovations in political campaigns: use of new technology and social media, campaign organization, fundraising, development of messages, GOTV efforts and how they are used in leadership, local, issue and national campaigns.

POLM 5012 [0.5 credit]

#### Political Advocacy

An exploration of the skills necessary to be a successful public advocate: strong public policy knowledge, in-depth knowledge of the political system, strong strategic/crisis communications skills and the ability to explain complex problems and solutions clearly and concisely.



POLM 5013 [0.5 credit]

**Political Management and the Media**

An examination of the organization and practices of major media. Coverage of public officials, public policy issues and legislative battles, paying particular attention to the current and seismic changes in the media as agencies of public address, and the consequences for politics and governance.

POLM 5014 [0.5 credit]

**Political Marketing**

Using case studies and simulation exercises, the course will provide students with an understanding of political marketing strategy, market intelligence, consultation and participation, political product development and branding, and marketing practices in government.

POLM 5015 [0.5 credit]

**Political Policy Landscape**

This seminar will focus on the key issues facing government, providing students with an in-depth understanding of specific policy questions and an opportunity to integrate political management skills into policy discussions.

POLM 5098 [1.0 credit]

**Practicum Placement**

Supervised work experience over 10 weeks in an appropriate placement approved by the graduate supervisor. It culminates in a 30-page (or equivalent) analytical work graded by the academic supervisor and one other member of the Carleton University faculty.

POLM 5900 [0.5 credit]

**Directed Study**

A program of supervised reading and preparation of written work in an area not covered by an existing graduate seminar may be arranged with permission of the Department.

## Political Science (PSCI)

### Department of Political Science

PSCI 5003 [0.5 credit]

#### Political Parties in Canada

A seminar on political parties and party systems in Canadian federal politics, including an examination of patterns of historical development, party organization and finance, relationships with social movements, and the impact of Canadian federalism.

PSCI 5006 [0.5 credit]

#### Legislatures and Representation in Canada

The role of Parliament and of the individual M.P. in terms of policy making, party discipline, and differing conceptions of representation. Also offered at the undergraduate level, with different requirements, as PSCI 4006, for which additional credit is precluded.

PSCI 5008 [0.5 credit]

#### The Politics of Climate Change

The politics and policy of climate change. Development of the climate change issues, international negotiations and agreements, national response strategies, perspectives on social and technological change, and the Canadian policy approach.

PSCI 5009 [0.5 credit]

#### Canadian Political Economy

A seminar on political economy as a traditional and contemporary approach to the study of Canadian politics and the Canadian state. Canada's economic development, social relations (including gender and race relations), and position in the international political economy is explored.

PSCI 5100 [0.5 credit]

#### Indigenous Politics of North America

Issues of governance regarding the original peoples of Canada, Mexico and the United States before and since the European invasion, including: movement for restoration of cultural, socio-economic, political, land and self-government rights. Also offered at the undergraduate level, with different requirements, as PSCI 4206, for which additional credit is precluded.

PSCI 5101 [0.5 credit]

#### Canadian Federalism

A study of the evolution and contemporary operation of the Canadian federal system, noting particularly the specific social, political, economic, and structural features which underlie its operational performance, its resilience in crisis, and its potential for adaptation.

PSCI 5102 [0.5 credit]

#### Statebuilding, State Capacity, and Reconstruction

Comparative politics of institutional reform and political reconstruction, focusing on selected transitional states.

PSCI 5103 [0.5 credit]

#### Canada-EU Relations

Relations between Canada and Europe in the context of European integration, with attention to policy issues affecting the relationship and/or areas of common policy challenges.

Precludes additional credit for PSCI 5609 and EURR 5106 if taken in the summer of 2004-05 or 2005-06.

(Also listed as EURR 5108.)

Prerequisite: previous course in European integration or permission of the instructor.

Intensive two week summer module.

PSCI 5105 [0.5 credit]

#### Post-Communist Politics in East Central Europe

A comparative examination of the emergence of post-communist political systems in East Central Europe.

PSCI 5106 [0.5 credit]

#### The Politics of Post-Soviet Successor States

A seminar on selected problems of nation-building in Russia, Ukraine, and other Soviet successor states.

PSCI 5107 [0.5 credit]

#### Globalization, Adjustment and Democracy in Africa

The nature of global pressures in Africa as states go through a "second wind" of political and economic change.

Also offered at the undergraduate level, with different requirements, as PSCI 4207, for which additional credit is precluded.

PSCI 5109 [0.5 credit]

#### Comparative Public Policy

A review of approaches to the study of policy, of the impact of political factors on policy, and of the substance of policy choices in such domestic fields as communications, social security, health, industrial and rural development policies in selected countries.

PSCI 5110 [0.5 credit]

#### Post-Soviet States and Societies

The relationship between social forces and state structures at both the national and local levels in the USSR and the post-soviet states. Precludes additional credit for EURR 4002. (Also listed as EURR 5002).

PSCI 5200 [0.5 credit]

#### Nationalism

A seminar on the historical and comparative study of nationalism, with emphasis on its role in the promotion of political change.

PSCI 5201 [0.5 credit]

#### Politics in Plural Societies

A seminar on politics in multicultural societies and multi-national states, including settler and post-colonial societies. Topics may include: conflict relating to race, religion, language, regionalism, intra-state nationalism, multicultural policies and theories of pluralism.

PSCI 5202 [0.5 credit]

#### Development Theory and Issues

A seminar on historical and current debates in development theory, including the origins, nature, and critiques of development processes in the Global South.

PSCI 5203 [0.5 credit]

#### Southern Africa After Apartheid

An exploration of the pathology of apartheid, the reasons for its end, and prospects for democratization and development in southern Africa in the era of globalization. Also offered at the undergraduate level, with different requirements, as PSCI 4203, for which additional credit is precluded.

PSCI 5204 [0.5 credit]

#### Elections

The conduct and meaning of elections in contemporary states. Attention to the connection of elections to concepts of representation, policy mandates, and political parties, and to electoral systems and referenda.

Precludes additional credit for PSCI 4204 if taken before 2006-07.

PSCI 5205 [0.5 credit]

#### Problems in American Government I

A research seminar on topics such as the distribution of power, decision-making processes, the impact of technology, strains in intergovernmental relations, civil-military relations, governmental news management and secrecy; executive accountability, and impediments to reform of Congress and the presidency.

PSCI 5300 [0.5 credit]

**The Political in Non-Western Texts**

'The political' in the works of both pre-modern and modern masters in non-western traditions, including the Persian, Indian, Chinese, and Arab.

PSCI 5302 [0.5 credit]

**Democratic Theories**

Analysis of various theories of democracy and community, from classical to modern.

PSCI 5303 [0.5 credit]

**Governmentality and Politics**

Examination of Foucault's concept of governmentality and work which has developed this idea, especially the relevance of governmentality for global political studies. Topics may include: sovereignty, biopolitics, technopolitics, neoliberalism and citizenship. Also listed as SOCI 5407. Also offered at the undergraduate level, with different requirements, as PSCI 4303, for which additional credit is precluded.

PSCI 5304 [0.5 credit]

**Political Inquiry**

This seminar focuses on the major approaches to research in political areas as discussed in contemporary philosophy of the social sciences, exploring the variety of explanatory strategies in use in the contemporary study of politics. Precludes additional credit for PSCI 5700.

PSCI 5305 [0.5 credit]

**Political Thought in the Modern Muslim Middle East**

Contemporary political thought in the Muslim Middle East. Secular and religious responses to the challenges of modernity. Readings may include writings of Arab, Turkish, and Iranian intellectuals. Also offered at the undergraduate level, with different requirements, as PSCI 4302, for which additional credit is precluded.

PSCI 5306 [0.5 credit]

**North American Political Traditions**

A seminar on the interpretations that may include American, Mexican, anglo-Canadian and franco-Canadian political traditions. Precludes additional credit for PSCI 5305.

PSCI 5308 [0.5 credit]

**Concepts of Political Community I**

A critical survey of concepts of political community, including the common good, justice, citizenship, statesmanship, democracy, and legitimacy, from ancient, modern, and contemporary political theory. Precludes additional credit for PSCI 4306.

PSCI 5309 [0.5 credit]

**Concepts of Political Community II**

A continued critical survey of concepts of political community, including the common good, justice, citizenship, statesmanship, democracy, and legitimacy, from ancient, modern, and contemporary political theory. Precludes additional credit for PSCI 4307. Prerequisite: PSCI 5308 or permission of the Department.

PSCI 5402 [0.5 credit]

**Politics of Diversity in Public Affairs**

An examination of the implications of diversity in public affairs including gender, race, sexual orientation and disability. Their impact on public policy creation and its implementation in public administration.

PSCI 5403 [0.5 credit]

**Gender and Global Politics**

Analysis of the gender dimensions of global politics. Topics may include: gender in the global political economy; feminist analysis of security; women's human rights; gender, migration and citizenship; women's movements in the global context, and the gendered dimensions of global governance.

PSCI 5405 [0.5 credit]

**Public Administration in Developing Countries**

A seminar on the literature and characteristics of development administration; comparison by region, country, and topic.

PSCI 5409 [0.5 credit]

**Research Seminar in Public Administration**

The content of this seminar will vary from year to year according to faculty research interests and student demand.

PSCI 5501 [0.5 credit]

**Selected Issues in Political Economy I**

A research seminar exploring a selected topic of current research having a political economy perspective, such as power and stratification; dynamics of state action; contrasting views on administration as an instrument of political economy; culture, ideology, and social relations; and the labour process. (Also listed as PECO 5501 and SOCI 5404.)

PSCI 5502 [0.5 credit]

**Selected Issues in Political Economy II**

A research seminar exploring a selected topic of current research having a political economy perspective, such as power and stratification; dynamics of state action; contrasting views on administration as an instrument of political economy; culture, ideology, and social relations; and the labour process. (Also listed as PECO 5502 and SOCI 5505.)

PSCI 5503 [0.5 credit]

**Topics in European Politics**

A research seminar dealing with a central theme of current research in European politics. Precludes additional credit for PSCI 5500.

PSCI 5506 [0.5 credit]

**Gender and Politics**

Selected gender dimensions of politics in comparative perspective. Topics may include: gendered nature of authority, gender regimes and state forms, feminist accounts of citizenship, representation, power and democracy, women's movements and anti-feminist movements, identity politics, gendered accounts of nationalism and multiculturalism.

PSCI 5507 [0.5 credit]

**Social Movements and Civil Society in Comparative Perspective**

Major theoretical approaches to social movements and civil societies in different countries. Specific movements to be examined may include the women's movement, the environmental movement, and the anti-globalization movement.

PSCI 5509 [0.5 credit]

**Governing in the Global Economy**

The course examines how national states respond to challenges of governing in an increasingly interdependent global economy. The course will be comparative in its focus, emphasizing advanced industrial societies primarily in western Europe and Canada.

PSCI 5600 [0.5 credit]

**Origins and Evolution of the Discipline of International Relations**

The disciplinary development of the academic field of International Relations. A critical examination of the historiography of the field, focusing on its great debates, institutional and national boundaries, and contemporary identity. Also offered at the undergraduate level, with different requirements, as PSCI 4600, for which additional credit is precluded.

PSCI 5601 [0.5 credit]

**Analysis of Canadian Foreign Policy**

A research seminar on contemporary Canadian external policies, with emphasis on the analysis of cases and issues, and comparisons with other national actors.

PSCI 5602 [0.5 credit]

**Ethics in International Relations**

Historical and contemporary approaches to normative theory and ethics in international relations, including Kantian, Hegelian, Marxist, postmodern and feminist ethics. Issues may include poverty and justice, human rights and humanitarian intervention.

PSCI 5607 [0.5 credit]

**Politics of North America**

Continentalism in Canadian foreign policy during the twentieth century, charting regional, economic, political, and defence relations in North America. Precludes additional credit for PSCI 4607 if taken before 2006-07.

PSCI 5608 [0.5 credit]

**European Integration and European Security**

A seminar focusing on issues related to the formation of supra-national decision-making structures in Europe. Also offered at the undergraduate level, with different requirements, as PSCI 4608, for which additional credit is precluded. (Also listed as EURR 4104/5104).

PSCI 5609 [0.5 credit]

**Selected Topics in European Integration Studies**

A seminar focusing on selected topics related to European integration in the post-World War II period. (Also listed as EURR 5106).

PSCI 5700 [0.5 credit]

**Basic Research Methods**

A course in applied research design and methodology, with emphasis on empirical research strategies that are amenable to quantification. Master's students who have not completed PSCI 2700 (or its equivalent) with high honours or better standing may be required to take this course.

PSCI 5701 [0.5 credit]

**Intermediate Polimetrics for Micro Data**

Intermediate research designs and statistical techniques primarily used in analyzing survey data. Selected topics may vary from year to year. Students intending to do research based on micro data are advised to take this course. Also offered at the undergraduate level, with different requirements, as PSCI 4701, for which additional credit is precluded. Prerequisite: PSCI 5700 or permission of the Department.

PSCI 5702 [0.5 credit]

**Intermediate Research Methods for Applied Political Science**

Applied methods for policy, politics and public affairs. Primarily quantitative but may have qualitative elements. Also offered at the undergraduate level, with additional or different requirements, as PSCI 4702 for which additional credit is precluded. Prerequisite: PSCI 5700 or permission of the Department.

PSCI 5801 [0.5 credit]

**Foreign Policies of African States**

The foreign policy determinants and international behaviour of African states. Each year, the seminar focuses on a particular issue area. Precludes additional credit for PSCI 5802. Prerequisite: permission of the Department.

PSCI 5802 [0.5 credit]

**Political Economy of Global Finance**

An exploration of the organization of the global financial system. Issues include the relationship between global finance and the state and problems associated with governing global finance. Also offered at the undergraduate level, with different requirements, as PSCI 4805, for which additional credit is precluded.

PSCI 5803 [0.5 credit]

**Transatlantic Security Issues**

NATO as a political and military alliance. NATO and 21st-century threats. Security roles for the European Union. Broader transatlantic security issues. Precludes additional credit for PSCI 4806 if taken before 2006-07.

PSCI 5805 [0.5 credit]

**Foreign Policy Analysis**

A research seminar dealing with selected problems in the study of foreign policy formulations and outcomes.

PSCI 5806 [0.5 credit]

**Strategic Thought and Issues in International Security**

A research seminar on the evolution of classical and contemporary strategic thought, and on current issues in international security.

PSCI 5807 [0.5 credit]

**Analysis of International Organizations**

A research seminar on process and change in contemporary forms of international organization.

PSCI 5808 [0.5 credit]

**International Political Economy**

A seminar on the changing international division of labour, and its consequences for world politics. Topics include differing patterns of industrialization, colonial relations, the role of the state, and current issues in international political economy. (Also listed as INAF 5808.) Prerequisite: Work at a senior undergraduate level in at least two of the following: international relations, development studies, international trade, or political economy; or permission of the Department.

PSCI 5810 [0.5 credit]

**Approaches to Environmental Politics**

Theoretical and methodological approaches to research in the field of environmental politics, including but not limited to public policy research. A variety of institutionalist, political economy, political ecology, and post-modern approaches will be examined.

PSCI 5900 [1.0 credit]

**Tutorial in a Selected Field**

Tutorials or reading courses on selected topics may be arranged with the permission of the Department.

PSCI 5901 [0.5 credit]

**Tutorial in a Selected Field**

Tutorials or reading courses on selected topics may be arranged with the permission of the Department.



PSCI 5904 [0.5 credit]

**Washington Center Internship**

A one-term internship in the NAFTA Leaders Program of The Washington Center, offered in Washington D.C. Prerequisite: permission of the Department.

PSCI 5905 [0.5 credit]

**Washington Center Seminar I**

A seminar offered by The Washington Center. Prerequisite: permission of the Department.

PSCI 5906 [0.5 credit]

**Washington Center Seminar II**

A seminar offered by The Washington Center. Prerequisite: permission of the Department.

PSCI 5908 [1.0 credit]

**M.A. Research Essay**

Tutorial for students who write a research essay rather than a thesis.

PSCI 5909 [2.0 credits]

**M.A. Thesis**

PSCI 5911 [0.0 credit]

**Co-operative Work Term**

Students may register in the co-op option according to the guidelines listed under Co-op Option in the Calendar of Graduate Studies. Prerequisite: permission of the Department.

PSCI 5912 [0.0 credit]

**Co-operative Work Term**

Students may register in the co-op option according to the guidelines listed under Co-op Option in the Calendar of Graduate Studies. Prerequisite: permission of the Department.

PSCI 5913 [0.0 credit]

**Co-operative Work Term**

Student may register in the co-op option according to the guidelines listed under Co-op Option in the Calendar of Graduate Studies. Prerequisite: permission of the Department.

PSCI 5915 [0.5 credit]

**Special Topics in Political Science**

A seminar on a selected topic in political science, to be determined by faculty research and teaching interests.

PSCI 6000 [0.5 credit]

**The Political Process in Canada I**

An analytical study of the democratic political process, with particular reference to political parties and elections, pressure groups, and political leadership in Canada. Precludes additional credit for PSCI 5100.

PSCI 6001 [0.5 credit]

**The Political Process in Canada II**

An analytical study of the democratic political process, with particular reference to political parties and elections, pressure groups, and political leadership in Canada. Precludes additional credit for PSCI 5100.

PSCI 6105 [0.5 credit]

**Comparative Politics I**

A research seminar dealing with theories, methods, and problems of comparison. Precludes additional credit for PSCI 5005.

PSCI 6106 [0.5 credit]

**Comparative Politics II**

A research seminar dealing with particular themes. Precludes additional credit for PSCI 5005.

PSCI 6300 [0.5 credit]

**Political Theory I**

An intensive examination of the major questions in classical, medieval, modern, and contemporary political philosophy. This course is historically comprehensive in scope and thematically oriented in depth.

Precludes additional credit for PSCI 5300.

PSCI 6301 [0.5 credit]

**Political Theory II**

An intensive examination of the major questions in classical, medieval, modern, and contemporary political philosophy. This course is historically comprehensive in scope and thematically oriented in depth.

Precludes additional credit for PSCI 5300.

PSCI 6407 [0.5 credit]

**Public Policy: Theory and Analysis**

Introduction to major theoretical approaches in the study and analysis of public policy and to current topics and debates in the field.

PSCI 6408 [0.5 credit]

**Public Affairs Management and Analysis**

A seminar on theories and practice in the management of public affairs, including the environment and administration of the public sector, public opinion, and public communications.

PSCI 6600 [0.5 credit]

**Theory and Research in International Politics I**

An examination of the principal problems in contemporary international relations theory and research, emphasizing the state of the field and current directions in it.

Precludes additional credit for PSCI 5600.

PSCI 6601 [0.5 credit]

**Theory and Research in International Politics II**

An examination of the principal problems in contemporary international relations theory and research, emphasizing the state of the field and current directions in it.

Precludes additional credit for PSCI 5600.

PSCI 6900 [0.5 credit]

**Ph.D. Field Examination I**

Ph.D. preparation for the major field examination I. The grade to be awarded will be that obtained on the field examination.

PSCI 6905 [0.5 credit]

**Ph.D. Field Examination II**

Ph.D. preparation for the major field examination II. The grade to be awarded will be that obtained on the field examination.

PSCI 6907 [0.5 credit]

**Research Methods and Design**

A survey of research methods and approaches to research design designed to assist in the preparation of thesis proposals. Coordinated by one instructor, but faculty from other fields will also participate. The grade for this course will be Satisfactory or Unsatisfactory.

Prerequisite: successful completion of comprehensive examinations or permission of the Department.

PSCI 6908 [0.5 credit]

**Thesis Proposal Workshop**

Student-led workshop focused on the preparation, presentation, and discussion of drafts of students' thesis proposals. The final assignment for the course will be the presentation of a full written draft of the thesis proposal. Graded *Satisfactory* or *Unsatisfactory*.

Graduate Courses - Political Science (PSCI)

Prerequisite: successful completion of comprehensive examinations or permission of the Department.

PSCI 6909 [5.0 credits]

**Ph.D. Thesis**

## Psychology (PSYC)

### Department of Psychology

PSYC 5001 [0.5 credit]

#### Qualitative Research Methods in Psychology

Introduction to various non-numerical, interpretive research methods. Attention will be devoted to the philosophical underpinnings of qualitative research, methods collecting and analyzing qualitative data, and issues regarding sampling, reliability, and validity.

PSYC 5002 [0.5 credit]

#### Ethics in Psychology

Ethical concepts and controversies related to research and practice in psychology. Topics may include ethical dilemmas and debates, professional codes of ethics, confidentiality, informed consent, legal rights and responsibilities, use of deception, or guidelines for research with special populations.

PSYC 5010 [0.5 credit]

#### Social Psychology Methodology

An overview of research methods for the study of social and organizational psychology. Topics may include observational and interview techniques, archival methods, questionnaire design, focus groups, qualitative analyses, and computer simulation. A research project will be required.

PSYC 5011 [0.5 credit]

#### Social Psychology I

Recent developments in social psychology theory and research. Topics may include social cognition, social influence, group processes, conflict resolution and social change.

PSYC 5012 [0.5 credit]

#### Organizational Psychology I

Recent developments in organizational psychology and research. Topics may include personnel selection, work motivation, morale and productivity, organizational decision making, leadership and social action.

PSYC 5021 [0.5 credit]

#### Forensic Assessment

Theoretical and empirical issues of the biopsychosocial antecedents of criminal behaviour. Classification and assessment of offenders for courts, probation and parole services. Risk assessment, management and service planning are addressed in both correctional and mental health contexts.

PSYC 5022 [0.5 credit]

#### Adult Offenders

Theoretical and empirical issues on the use of different types of interventions in modifying adult criminal behaviour. Institutional treatment and community-based approaches are discussed.

PSYC 5023 [0.5 credit]

#### Witnesses, Victims and Juries

A review of research and theory concerning eyewitnesses, victims of crime, and jury decision-making. Topics such as police interviewing techniques and practices, eyewitness identification and testimony, victim rights, effects and outcomes, and influences on jury verdicts are discussed.

PSYC 5024 [0.5 credit]

#### Juvenile Delinquency

An examination of the development of delinquency with a focus on etiology, risk factors, assessment, prediction, and developmental trajectories. Individual, group, and family institutional and community treatment approaches are examined.

PSYC 5104 [0.5 credit]

#### Psychology of Women

This seminar will consider and evaluate research concerning the psychology of women, including research methods, gender roles and gender differences.

PSYC 5105 [0.5 credit]

#### Fundamentals of HCI Design and Evaluation

Strategies and practices in HCI design and evaluation. Students will learn to perform studies in user interface analysis and design, read the research literature critically, summarize important points from readings, write papers, design user interfaces and present their written and oral work. (Also listed as HCIN 5100.)

PSYC 5106 [0.5 credit]

#### Research Methods in HCI

An introduction to quantitative and qualitative research methods in HCI. Students will acquire skills in collecting and analyzing HCI data, presenting the findings and specifying practical implications. (Also listed as HCIN 5401.)

PSYC 5107 [0.5 credit]

#### Psychology of Family Violence

Biopsychosocial antecedents and consequences of the abuse and neglect of children, partners and elders within the family. The efficacy of preventive and treatment strategies is also assessed, as are current controversies and research methods in the area.

PSYC 5109 [0.5 credit]

#### Historical and Social Foundations of Social Psychology

History of psychological social psychology (1890s to 1960s), with emphasis on the development of social psychology as both an experimental and an interpretive science. Some attention is given to historiographic issues and the history of the human sciences generally.

PSYC 5209 [0.5 credit]

#### Psychology of Health and Illness

A critical examination of scientific theory and research on the role of psychological factors in health and illness, and the use of psychological interventions in treating illness and maintaining health. Topics include the biopsychological model of illness, stress and coping, psychoneuroimmunology, personality, and stress management.

PSYC 5300 [0.5 credit]

#### Perceptual Processes

Theoretical and empirical issues of the area of perception. Topics may include: psychophysics, constancies, depth perception, pattern recognition, iconic memory, attention, hemispheric specialization.

PSYC 5301 [0.5 credit]

#### Psychophysics

A study of classic and contemporary psychophysical methods. Applications to cognition will be included.

PSYC 5401 [0.5 credit]

#### Multivariate Techniques

Applications of multivariate statistical techniques with psychological data including multivariate analysis of variance, canonical correlation, discriminant function analysis, and factor analysis. Extensive use is made of statistical software. Prerequisite: PSYC 5410 and PSYC 5411.

PSYC 5407 [0.5 credit]

**Tests and Measurements I: Intellectual/Cognitive**

This course is designed to assist students learning of basic cognitive/intellectual assessment procedures. Students will be required to administer and interpret a variety of tests such as the WAIS-R, Wechsler Memory Scale, Rey Auditory Verbal Learning Test, and Buschke's Cued Recall Test.

Prerequisite: undergraduate course in testing or psychometrics.

PSYC 5410 [0.5 credit]

**Advanced Analysis of Variance**

Concepts and applications of advanced analysis of variance designs, including factorial, within groups, and hierarchical designs, and analysis of covariance. Extensive use is made of statistical software.

PSYC 5411 [0.5 credit]

**Advanced Regression**

Concepts and applications of advanced regression analyses, including multiple regression, hierarchical and polynomial techniques. Extensive use is made of statistical software.

PSYC 5412 [0.5 credit]

**Topics in Advanced Statistics and Methods**

Selected topics in advanced statistics and research methods relevant to broad areas of psychology, varying from year to year. Topics may include broad analytic approaches, such as, program evaluation, qualitative methods, nonparametric statistics, among others.

Prerequisite: PSYC 5410 and PSYC 5411 and permission of the Department.

PSYC 5413 [0.25 credit]

**Workshops in Advanced Statistics and Methods**

Intensive focus on specific statistical or methodological approaches relevant to psychological research (e.g. structural equation modeling, advanced factor analysis, meta-analysis, observational methods).

Prerequisite: PSYC 5410 and PSYC 5411 and permission of the Department.

PSYC 5500 [0.5 credit]

**Developmental Psychology Methodology**

An overview of research methods in the study of developmental psychology. Topics may include: observational and interview techniques, use of archival data, longitudinal designs, questionnaire development, and basic assessment methods. A research project will be required.

PSYC 5503 [0.5 credit]

**Advanced Topics in Developmental Psychology: Social & Emotional Development**

Recent developments in developmental psychology theory and research related to the study of social and emotional development. Topics may include child temperament, parenting and the family, peer relationships, self-system, and developmental psychopathology.

PSYC 5504 [0.5 credit]

**Advanced Topics in Developmental Psychology: Cognitive Development**

Recent developments in developmental psychology theory and research related to the study of cognitive development. Topics may include: language, literacy, numeracy, and theory of mind.

PSYC 5601 [0.5 credit]

**Contemporary Research in Personality**

Current controversial issues in personality research, and selected theoretical and research studies in personality.

PSYC 5700 [0.5 credit]

**Advanced Topics in Cognition I**

An in-depth study of a specific topic in the area of basic cognitive processes. Topics will vary from year to year and may include judgmental processes, object identification, selective attention and spatial cognition.

PSYC 5703 [0.5 credit]

**Cognition I**

A survey of issues and research methodologies in basic cognitive processes. Topics may include detection and processing of sensory signals, pattern recognition, attention, mental imagery and automaticity.

PSYC 5704 [0.5 credit]

**Cognition II**

A survey of issues and research methodologies in higher-level cognitive processes. Topics may include memory, representation of knowledge, decision processes, and the procedural/declarative controversy. The course may be focused on a particular area (e.g. reading, transfer in problem solving).

PSYC 5800 [0.5 credit]

**Special Topics in Psychology**

The topics of this course will vary from year to year, and will be announced in advance of the registration period.

PSYC 5900 [0.5 credit]

**Directed Studies**

In-depth investigation of selected problems in psychology by means of directed library research. Registration is restricted, permission to register being granted only by the graduate committee. A final report must be filed in the departmental office prior to submission of course grade.

PSYC 5901 [0.5 credit]

**Independent Research**

Permission to register and approval of research plan must be obtained from the graduate committee. A final research report must be filed in the departmental office prior to submission of course grade. The course may be repeated for credit.

PSYC 5903 [0.5 credit]

**Practicum in Psychology**

The practicum offers master's level students the opportunity to gain experience in a range of applied psychology settings with the goal of integrating academic and practical aspects of psychology. This course cannot be repeated for credit. Students will receive a grade of satisfactory or unsatisfactory. Details are available from the Department.

PSYC 5906 [0.0 credit]

**Pro-Seminar in Psychology**

The pro-seminar is based on the departmental invited colloquia series. This course provides breadth in terms of exposure to research. Colloquia are offered from September to April.

PSYC 5909

**M.A. Thesis**

PSYC 6101 [0.5 credit]

**Social Psychology II**

A seminar covering a selection of advanced topics in social psychology theory and research taken from recent publications and debates in the discipline.

PSYC 6102 [0.5 credit]

**Organizational Psychology II**

A seminar covering advanced topics in organizational psychology theory and research taken from recent publications and debates in the discipline.



PSYC 6104 [0.5 credit]

**Seminar in University Teaching**

Theoretical and empirical work related to teaching in higher education. Analysis of instructional discourse, use of language in classroom decision-making, bases of effective practice and methods of instruction. Constructivist principles of teaching and learning. Role of teaching in university scholarship. Also listed as LALS 5204.

Precludes additional credit for LALS 5905 (Section T, 1997-98), LALS 5905 (Section X, 1998-99), LALS 5905 (Section W, 1999-2000), LALS 5905 (Section W, 2000-01), LALS 5905 (Section X, 2001-02), LALS 5905 (Section W, 2002-03) and LALS 5204.

PSYC 6105 [0.5 credit]

**Psychological Aspects of Computer Use**

An investigation of human factors related to the effective design of computer hardware and software. Topics may include the design and evaluation of information search procedures, graphic displays, and operation manuals on the assessment of usability. A research project will be required.

PSYC 6106 [0.5 credit]

**Social Aspects of Computer Use**

An investigation of the social psychological factors affecting the use of computers and the social consequences of their use. Topics may include the use of computers in higher education and the social consequences of the Internet for the Third World.

PSYC 6700 [0.5 credit]

**Advanced Topics in Cognition II**

An in-depth study of a specific topic in higher-level cognitive processes. Topics will vary from year to year and may include mathematical knowledge and processes, problem solving, or models of reading.

PSYC 6800 [0.5 credit]

**Special Topics in Psychology**

The topics of this course will vary from year to year, and will be announced in advance of the registration period.

PSYC 6900 [0.5 credit]

**Directed Studies**

Same description as PSYC 5900.

PSYC 6901 [0.5 credit]

**Independent Research**

Permission to register and approval of research plan must be obtained from the graduate committee. A final research report must be filed in the departmental office prior to submission of course grade. The course may be repeated for credit.

PSYC 6903 [0.5 credit]

**Practicum in Psychology**

The practicum offers Ph.D. students the opportunity to gain experience in a range of applied psychology settings with the goal of integrating academic and practical aspects of psychology. This course cannot be repeated for credit. Students will receive a grade of satisfactory or unsatisfactory. Details are available from the Department.

PSYC 6906 [0.0 credit]

**Pro-Seminar in Psychology I**

The pro-seminar is based on the departmental invited colloquia series. This course provides breadth in terms of exposure to research. Colloquia are offered from September to April.

PSYC 6907 [0.0 credit]

**Pro-Seminar in Psychology II**

The pro-seminar is based on the departmental invited colloquia series. This course provides breadth in terms of exposure to research. Colloquia are offered from September to April.

PSYC 6909

**Ph.D. Thesis**

## Public Policy and Administration (PADM)

### School of Public Policy and Administration

PADM 5111 [0.5 credit]

#### Microeconomics for Policy Analysis

Key concepts in microeconomic theory and their application to public policy. Topics may include incentives, rational choice theory, market structure, welfare economics, and strategic behaviour. Precludes additional credit for PADM 5203. Prerequisite: ECON 1000 or equivalent.

PADM 5112 [0.5 credit]

#### Macroeconomics for Policy Analysis

Theoretical foundations and current policy debates concerning economic growth and sustainable development, globalization and the open economy, stabilization policy, and fiscal and monetary policy are analyzed in the Canadian and international context.

Precludes additional credit for PADM 5202.

Prerequisite: ECON 1000 or equivalent.

PADM 5113 [0.5 credit]

#### Research Methods and Design I

Methods used in qualitative policy research. Topics may include the formulation of research problems, research design and techniques for collecting and managing evidence, and the role of qualitative research in the analysis of public policies and programs.

Precludes additional credit for PADM 5603.

PADM 5114 [0.5 credit]

#### Research Methods and Design II

Descriptive statistics, probability theory and sampling distributions, hypothesis testing of quantitative and qualitative population parameters, and regression analysis.

Precludes additional credit for PADM 5501.

PADM 5115 [0.5 credit]

#### Introduction to State and Society

Classic and contemporary debates about the relationship between the state, society, and economy. The development of the state, and changing conceptions of citizenship, democracy, and nationalism as well as the state's role in the post-WWII international order and the challenges of globalization.

Precludes additional credit for PADM 5607.

PADM 5116 [0.5 credit]

#### Policy Analysis and Contemporary Governance

Policy analysis and policy processes, emphasizing the contemporary context and challenges facing decision makers. Selected policy issues.

Precludes additional credit for PADM 5608.

Prerequisite: PSCI 2003 or equivalent.

PADM 5117 [0.5 credit]

#### Public Management

Principles and processes of public-sector management as they function through cabinet-parliamentary government, federalism, the public service bureaucracy and the judiciary. Institutional reforms and changes in the philosophy of public sector management.

Precludes additional credit for PADM 5000.

Prerequisite: PSCI 2003 or equivalent.

PADM 5211 [0.5 credit]

#### Intergovernmental Relations

Major cost-sharing and fiscal transfer agreements. The intergovernmental mechanisms for policy and administrative coordination in selected policy fields.

Precludes additional credit for PADM 5003.

PADM 5212 [0.5 credit]

#### Civil Society and Public Policy

The influence of various interests, social movements, voluntary organizations and citizens in the policy process in a Canadian and comparative context.

PADM 5213 [0.5 credit]

#### Gender and Public Policy

The impact of public policy on gender relations and how gender relations shape policy. Topics covered may include gender inequalities in earnings and employment, macroeconomic policy, gender and development, and gender-based analysis. Also offered at the undergraduate level, with different requirements, as PADM 4213, for which additional credit is precluded.

Precludes additional credit for PADM 4701 and PADM 5701.

PADM 5214 [0.5 credit]

#### Budgetary Policy in the Public Sector

Selected aspects of the expenditure and revenue budget and budgetary process at all levels of government. Critical review of actual budgets and budgetary processes. Also offered at the undergraduate level, with different requirements, as PADM 4214, for which additional credit is precluded.

Precludes additional credit for PADM 5103.

PADM 5215 [0.5 credit]

#### Benefit-Cost Analysis

Benefit-cost analysis and its application to public-sector investment, pricing policy, discount rates, marginal cost and shadow pricing, and the handling of risk and uncertainty.

Precludes additional credit for PADM 5200.

PADM 5216 [0.5 credit]

#### Economic Models of Politics and Public Policy

Microfoundations of collective action, majority rule, political institutions and bureaucracy. Applications to various issues in Canadian and international public policy.

Precludes additional credit for PADM 5609.

PADM 5217 [0.5 credit]

#### Applied Microeconomic Policy Analysis

Microeconomic theory applied to public policy problems and issues.

Precludes additional credit for PADM 5204.

PADM 5218 [0.5 credit]

#### Analysis of Socio-economic Data

Correlation and regression analyses to test hypotheses about the relationships between socio-economic variables.

Precludes additional credit for PADM 5502.

PADM 5219 [0.5 credit]

#### Advanced Statistical Policy Analysis

Econometric research on selected policy issues using selected econometric techniques.

Precludes additional credit for PADM 5705.

Prerequisite: PADM 5218 or equivalent.

PADM 5220 [0.5 credit]

#### Regulation and Public Policy

Political, economic, legal, and organizational theories of regulation in the Canadian and comparative context. Processes and consequences of regulatory practice in selected Canadian public policy fields. Also offered at the undergraduate level, with different requirements, as PADM 4220, for which additional credit is precluded.

Precludes additional credit for PADM 5002.

PADM 5221 [0.5 credit]

**Health Policy in Canada**

Canadian health policies and programs set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with different requirements, as PADM 4221, for which additional credit is precluded.

Precludes additional credit for PADM 4009 and PADM 5009.

PADM 5222 [0.5 credit]

**Economics and Health Policy**

This course applies microeconomic theory to a discussion of health policy. Focus on issues of particular interest to a student of Canadian health care policy.

PADM 5223 [0.5 credit]

**Canadian Economic Policy**

Overview of Canadian economic development and how it has been affected by governments. Topics may be drawn from monetary, fiscal, industrial, trade, labour market or competition policies, viewed in contemporary and historical contexts.

Precludes additional credit for PADM 5205.

PADM 5224 [0.5 credit]

**Aboriginal Policy**

Canadian policies and programs on aboriginal peoples and aboriginal peoples' own policies as nations set in a comparative political-economic and institutional context.

Also offered at the undergraduate level, with different requirements, as PADM 4224, for which additional credit is precluded.

Precludes additional credit for PADM 4806 and PADM 5806.

PADM 5225 [0.5 credit]

**Trade Policy**

Canadian multilateral and regional trade policies and programs set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with different requirements, as PADM 4225, for which additional credit is precluded.

Precludes additional credit for PADM 4807 and PADM 5807.

PADM 5226 [0.5 credit]

**Tax Policy**

Canadian tax policies set in a comparative political-economic and institutional context.

Also offered at the undergraduate level, with different requirements, as PADM 4226, for which additional credit is precluded.

Precludes additional credit for PADM 4509 and PADM 5509.

PADM 5227 [0.5 credit]

**Education Policy**

Canadian policies and programs on education set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with different requirements, as PADM 4227, for which additional credit is precluded.

Precludes additional credit for PADM 4809 and PADM 5809.

PADM 5228 [0.5 credit]

**Social Policy**

The nature and historical development of social programs in capitalist countries, with particular focus on Canada. The course will concentrate on developing a critical understanding of the social forces shaping these programs. Also offered at the undergraduate level, with different requirements, as PADM 4228, for which additional credit is precluded.

Precludes additional credit for PADM 4604 and PADM 5604.

PADM 5229 [0.5 credit]

**The Health of Populations**

Assessment of the medical model, and perspectives on the social and economic determinants of health, population health, and community health. The health of particular groups in Canada (e.g., women, Aboriginal peoples). International comparisons will be made.

PADM 5272 [0.5 credit]

**Policy Seminar (Policy Analysis Concentration)**

One or more selected policy areas or specialized aspects of policy analysis. The policy field or topic will change each year.

PADM 5291 [0.5 credit]

**Directed Studies (Policy Analysis Concentration)**

A tutorial or directed reading course on selected subjects related to policy analysis.

PADM 5301 [0.0 credit]

**Co-operative Work Term**

Prerequisites: registration in the Co-operative Education Option of the M.A. program and permission of the Co-op Supervisor.

PADM 5302 [0.0 credit]

**Co-operative Work Term**

Prerequisites: registration in the Co-operative Education Option of the M.A. program and permission of the Co-op Supervisor.

PADM 5303 [0.0 credit]

**Co-operative Work Term**

Prerequisites: registration in the Co-operative Education Option of the M.A. program and permission of the Co-op Supervisor.

PADM 5411 [0.5 credit]

**Organization Theory**

Focusing on major theoretical approaches to organizations, the course develops practical insights into issues such as organizational design, leadership, technology, culture and diversity, motivation and power. It applies these insights to organizations in both the public and private sectors in a variety of national contexts.

Precludes additional credit for PADM 5300.

PADM 5412 [0.5 credit]

**Ethics and Accountability in the Public Sector**

Philosophy, principles and values that have shaped Canada's framework of public sector ethics and accountability. The relationship between ethics, accountability and good governance and the reforms designed to limit unethical behaviour and strengthen accountability. Also offered at the undergraduate level, with different requirements, as PADM 4412, for which additional credit is precluded.

Precludes additional credit for PADM 4703.

PADM 5413 [0.5 credit]

**Law of Public Authorities I**

The legal environment of Canadian public administration, Canadian law, institutions and processes. Canadian legal history, adversarial adjudicative procedures, delegation of powers to public authorities, procedural justice in government decision making, and controls on public authorities and enforcement of ethics.

Precludes additional credit for PADM 5306.

PADM 5414 [0.5 credit]

**Law of Public Authorities II**

Characteristics and selected problems of control of administrative action. Topics may include: varieties of constitutional, legal and judicial control, impact



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of the Charter, reforms to administrative law control systems in Canada, and comparisons with developments outside Canada.  
 Precludes additional credit for LAWS 4507 and PADM 5307.  
 Prerequisite: PADM 5413.

**PADM 5415 [0.5 credit]**  
**Strategic Management in the Public Sector**  
 Key concepts, principles and tools of strategic management, and their use in planning and policy implementation in the public sector. Reviews critical perspectives and cases in order to identify some of the limitations of strategic management.

**PADM 5416 [0.5 credit]**  
**Budgetary Management for the Public Sector**  
 Theory and practice of budgeting in the public sector. From a management perspective, the course focuses on the objectives, methods and systems for the control and reporting of expenditures.

**PADM 5417 [0.5 credit]**  
**Principles of Finance**  
 The use of financial assets to obtain funds, evaluative criteria to compare alternative uses of funds, and derivative contracts to manage risk. Public sector applications of these practices are emphasized.  
 Precludes additional credit for PADM 5101.

**PADM 5418 [0.5 credit]**  
**Human Resources Management**  
 The field of human resources management including the roles of human resource departments, employee motivation, staffing, compensation, benefits, training and development and employee relations.  
 Precludes additional credit for PADM 5801.

**PADM 5419 [0.5 credit]**  
**Industrial Relations and Public Sector Collective Bargaining**  
 The basic concepts of industrial relations, with respect to both public and private sector employees and organizations.  
 Precludes additional credit for PADM 5804.

**PADM 5420 [0.5 credit]**  
**Policy and Program Evaluation**  
 Selected concepts, issues, and processes in applied governmental planning and evaluation, utilizing both Canadian and comparative experiences.  
 Precludes additional credit for PADM 5602.

**PADM 5421 [0.5 credit]**  
**Globalizing Public Management**  
 Public sector reform has swept the developed and developing world in the last two decades. The dynamics of this global movement, the models exported and adopted, and the success and failure of these exports.

**PADM 5422 [0.5 credit]**  
**Urban and Local Government**  
 The role of municipal government in the context of Canadian federalism. Current economic, political and social trends affecting Canada's major urban centres including growth, amalgamation, fiscal reform, immigration, housing, community engagement, and sustainable development.  
 Precludes additional credit for PADM 5106.

**PADM 5423 [0.5 credit]**  
**Third Sector Governance and Management**  
 Governance and management of voluntary/nonprofit organizations and their role in democracy, public policy, and service delivery.  
 Precludes additional credit for PADM 5109.

**PADM 5424 [0.5 credit]**  
**Evaluation Cases and Applications**  
 Selected case studies in the development, design, management and implementation of policy and program evaluation.  
 Prerequisite: PADM 5420.

**PADM 5472 [0.5 credit]**  
**Policy Seminar (Public Management Concentration)**  
 One or more selected policy areas or specialized aspects of public management. The policy field or topic will change each year.

**PADM 5491 [0.5 credit]**  
**Directed Studies (Public Management Concentration)**  
 A tutorial or directed reading course on selected subjects related to public management.

**PADM 5510 [0.5 credit]**  
**Energy Economics**  
 Micro- and macroeconomic concepts and techniques applied to such topics as international energy markets, energy production, and energy consumption.

**PADM 5511 [0.5 credit]**  
**Energy Management**  
 The fundamentals of energy management, focusing on current practices in both private and public sector organizations.

**PADM 5512 [0.5 credit]**  
**International Politics of Sustainable Energy**  
 Recent historical and contemporary developments in the role of energy in inter- and intranational relations, involving such topics as Canada/US relations, the international political economy of oil, energy security, and climate change.

**PADM 5515 [0.5 credit]**  
**Sustainable Energy Policy**  
 The institutions involved in energy policy, the processes through which policy is made, and the substantive energy-related issues currently preoccupying policy makers.  
 Precludes additional credit for PADM 5616.

**PADM 5572 [0.5 credit]**  
**Policy Seminar (Sustainable Energy)**  
 One or more selected topics or specialized aspects of sustainable energy policy. The topic will change each year.

**PADM 5611 [0.5 credit]**  
**Science and Technology Policies**  
 Theory and practice regarding governmental policies for science and technology, and the use of scientific knowledge in the policy and regulatory processes of government. Concerns regarding the ethical issues and the transparency of science in government. Also offered at the undergraduate level, with different requirements, as PADM 4611, for which additional credit is precluded.  
 Precludes additional credit for PADM 5400.

**PADM 5612 [0.5 credit]**  
**Industrial Policy, Innovation and Sustainable Production**  
 Sustainable production theory and key drivers, barriers and opportunities influencing innovation in industrial systems and processes. The relationship of public policies and industry practices are explored in a number of sectors. Also offered at the undergraduate level, with different requirements, as PADM 4612, for which additional credit is precluded.  
 Precludes additional credit for PADM 4600 and PADM 5600.



PADM 5613 [0.5 credit]

**Science, Risk and Evaluation**

Risk-benefit theories and practices and related issues in the evaluation of science and technology; how they are handled in applied regulatory and policy institutions in selected sectors (e.g. pesticides; health protection; biotechnology).

Precludes additional credit for PADM 5403.

PADM 5614 [0.5 credit]

**Natural Resource Management**

Governance and management of natural resources from a Canadian and international perspective. The use of various management instruments, regulatory approaches and community-based and co-management institutions are evaluated with evidence from several case studies from around the world.

PADM 5615 [0.5 credit]

**Politics and Policy of Energy in Canada**

Dilemmas associated with energy policy in Canada. Economic, social and environmental dimensions of energy decision making; Canadian issues within the context of a changing international scene and long term energy transitions. Also offered at the undergraduate level, with different requirements, as PADM 4615, for which additional credit is precluded. Precludes additional credit for PADM 5515.

PADM 5616 [0.5 credit]

**Environmental Policy**

Canadian environmental policies and programs set in a comparative political-economic and institutional context. Also offered at the undergraduate level, with different requirements, as PADM 4616, for which additional credit is precluded.

Precludes additional credit for PADM 4008 and PADM 5008.

PADM 5617 [0.5 credit]

**Implementing Sustainable Development in Industrialized Countries**

Genesis and evolution of the idea of sustainable development and the ways in which it is influencing public policy and public sector structures and processes. Canada's performance in implementing sustainable development will be assessed in comparison with other industrialized countries.

PADM 5618 [0.5 credit]

**Environmental and Ecological Economics**

Environmental and ecological economics with applications to public policy and environmental management issues. Concepts of sustainability, non-market valuation and ecological stability, the determination of environmental targets, and the use of policy instruments, incentives and emissions markets.

PADM 5619 [0.5 credit]

**Urban Sustainability**

Impact of economic growth and social change on cities and their attempts to forge sustainable growth. Incorporating political and fiscal issues, the focus is on 'smart growth' policies and initiatives in areas such as environmental control, transport, land use, housing and infrastructure.

PADM 5620 [0.5 credit]

**The Science, Politics and Economics of Global Climate Change**

Scientific issues at the core of climate change and the domestic and international policy responses. Various environmental, economic, and political implications for both the developed and developing worlds and for the various regions of Canada.

PADM 5672 [0.5 credit]

**Policy Seminar (Innovation, Science and Environment Concentration)**

One or more selected policy areas and topics related to innovation, science and environment. The topic will change each year.

PADM 5691 [0.5 credit]

**Directed Studies (Innovation, Science and Environment Concentration)**

A tutorial or directed reading course on selected subjects related to innovation, science and the environment.

PADM 5811 [0.5 credit]

**The International Policy Framework**

The evolution of the main international rules and institutions governing the economic relationships among nation states, with emphasis on the changing roles of the Bretton Woods institutions (IMF, World Bank, GATT/ WTO).

Precludes additional credit for PADM 5001.

PADM 5812 [0.5 credit]

**Governance in Developing Countries**

The roles of the state and civil society in the governance of developing countries in the context of public sector reform and globalization.

PADM 5813 [0.5 credit]

**The Evolution of World Bank/IMF Policy Conditionality**

The changing nature of World Bank/IMF policy conditionality with emphasis on the period since the onset of the 1982 debt crisis.

Precludes additional credit for PADM 5808.

PADM 5814 [0.5 credit]

**Program and Project Management**

The context, critical issues and methods relating to the planning and implementation of development programs and projects.

Precludes additional credit for PADM 5107.

PADM 5815 [0.5 credit]

**Civil Society Organizations and Development**

The context, roles, structures and strategies of nongovernmental organizations in the development process at the global, national and local levels. The role of development aid and NGOs is considered. (Also listed as IDMG 5615.)

PADM 5816 [0.5 credit]

**Program Evaluation in Developing Countries**

The context, critical issues and methods relating to the evaluation of development interventions. (Also listed as IDMG 5616.)

PADM 5817 [0.5 credit]

**Health Policy in Developing Countries**

Debates regarding health policy in the developing world, in the context of the global health sector reform movement, trade and intellectual property regimes, and strategies of corporate and NGO actors. Issues of gender, class and the determinants of health. (Also listed as IDMG 5617.)

Also offered at the undergraduate level, with different requirements, as PADM 4817, for which additional credit is precluded.

PADM 5818 [0.5 credit]

**Theories of Development**

A survey of the theories and evidence to explain processes of growth and development, and their unevenness, in low-income countries and transition economies.

Precludes additional credit for INAF 5007.

PADM 5872 [0.5 credit]

**Policy Seminar (International and Development Concentration)**

One or more selected policy areas and topics related to policy and administration in the international and development context. The topic will change each year.

PADM 5891 [0.5 credit]

**Directed Studies (International and Development Concentration)**

A tutorial or directed reading course on selected subjects related to international and development issues.

PADM 5908 [1.0 credit]

**Research Essay**

PADM 5909 [2.0 credits]

**M.A. Thesis**

PADM 6111 [0.5 credit]

**Markets, Prices and Government**

The contributions and limitations of microeconomic theory for analyzing the behaviour of public and private decision makers. Issues include different forms of market failure, and different understandings of the appropriate role of government in addressing them.

Precludes additional credit for PADM 6008 and PADM 6102.

PADM 6112 [0.5 credit]

**Policy Institutions and Processes**

Economic and political science approaches to the role of ideas, interests and institutions in the public policy process and instrument choice. Topics may include policy paradigms and political culture, interest groups, theories of state formation, behaviour of bureaucracies and legislative institutions.

Precludes additional credit for PADM 6005, PADM 6007 and PADM 6105.

PADM 6113 [0.5 credit]

**Public Policy Analysis**

The application of economic and political science approaches to public policy analysis in Canadian and comparative settings. The policy fields examined may include social welfare and labour market policy, tax and trade policy, science policy and environment policy.

Precludes additional credit for PADM 6004, PADM 6009 and PADM 6106.

PADM 6114 [0.5 credit]

**Foundations of Policy Analysis**

Assessment and comparison of key theoretical traditions in explaining and analyzing public policy.

PADM 6200 [0.5 credit]

**Doctoral Research Seminar**

Issues in developing research proposals and conducting public policy research; includes research presentations by senior doctoral students and faculty. Required for second-year doctoral students who present their thesis proposals. Issues surrounding quantitative or qualitative methods in public policy analysis may be discussed. Graded Pass/Fail.

PADM 6900 [0.5 credit]

**Ph.D. Comprehensive Examination**

Ph.D. preparation for the comprehensive examination. The grade to be awarded will be that obtained on the comprehensive examination.

PADM 6901 [0.5 credit]

**Ph.D. Specialization Tutorial**

A Ph.D. tutorial covering advanced theory and research in an area of specialization generally related to public policy. Specific topics will be selected in consultation with, and must be approved by, the academic supervisor and Ph.D. co-ordinator.

PADM 6902 [0.5 credit]

**Ph.D. Specialization Tutorial**

A Ph.D. tutorial covering advanced theory and research in an area of specialization generally related to public policy. Specific topics will be selected in consultation with, and must be approved by, the academic supervisor and Ph.D. co-ordinator.

PADM 6909 [6.5 credits]

**Ph.D. Thesis**

Students will normally be supervised by faculty in the School of Public Administration but may also seek supervision from faculty in other social sciences departments, schools, and institutes.

## Religion (RELI)

### College of the Humanities

RELI 5780 [0.5 credit]

#### **Graduate Research Seminar**

This mandatory seminar, intended as a workshop, guides students through the process of producing a major paper proposal and the initial stages of writing the research essay.

RELI 5801 [0.5 credit]

#### **Seminar in the Discipline**

This mandatory seminar introduces students to graduate level work in Religious Studies. A faculty team addresses current debates and practices in both the discipline and profession. Students are evaluated on a pass/fail basis.

RELI 5802 [0.5 credit]

#### **Seminar in Religion and Public Life**

This mandatory seminar introduces the main methodological and theoretical tools of the program. The course focuses on key thinkers and case studies to approach "religion and public life" from Religious Studies perspectives.

RELI 5850 [0.5 credits]

#### **Seminar in the Study of Religion**

Thematic seminar related to the comparative or general study of Religion and Public Life.

RELI 5851 [0.5 credits]

#### **Seminar in Western Traditions**

Thematic seminar related to the study of Religion and Public Life with a focus on one or more Western traditions.

RELI 5852 [0.5 credits]

#### **Seminar in Asian Religions**

Thematic seminar related to the study of Religion and Public Life with a focus on one or more Eastern traditions.

RELI 5908 [1.5 credits]

#### **Research Essay**

A research essay on a topic related to the theme of Religion and Public Life. The topic must be chosen with the approval of the Research Essay supervisor.

## Social Work (SOWK)

### School of Social Work

SOWK 5101 [0.5 credit]

#### Social Policy Analysis

Conceptual, theoretical, and empirical tools for the analysis of social policies in Canadian society.

SOWK 5102 [0.5 credit]

#### Political Economy of Health

Distinctions and connections between health and health care. Who receives care, who provides it, who pays for it, and who makes the decisions affecting it.

SOWK 5105 [0.5 credit]

#### Poverty and Income Security

Examination of theories of poverty and wealth, conflicting understandings of poverty and the unequal distribution of income and wealth in Canada. Theories of poverty and wealth as they influence social policy, notably universal programs, social welfare services, income redistribution, and taxation.

SOWK 5106 [0.5 credit]

#### Women and Social Policy

Structural analysis of social policy affecting women. Relationship of feminist scholarship to the practical work of developing policy and to policy outcomes for women. Impact of the women's movement on the formal processes of policy making.

SOWK 5301 [0.5 credit]

#### Women, Male Violence and Social Change

Focus on male violence against women. Theory, responses of the state and the justice system, and practice approaches to helping women and the men who abuse them, and initiatives for social change.

SOWK 5302 [0.5 credit]

#### Mental Health

Historical development, legislative framework, institutional and service structure, and practice issues related to mental health services in Canada. The interface between mental health and sexual abuse, family violence, racism, corrections, aging and immigration.

SOWK 5306 [1.0 credit]

#### Advanced Theory for Social Administration and Policy

Core concepts and ideas about the modern welfare state and the Canadian welfare state. The role and nature of social policy in the Canadian political system. Methods of analysis of contemporary social policy.

Precludes additional credit for SOWK 5305.

Prerequisite: registration in M.S.W. Year II.

SOWK 5307 [1.0 credit]

#### Advanced Theory for Direct Intervention

Advanced integration of social work knowledge, skills and ethics for practice with individuals, families, small groups and communities. Structural analysis of personal and social problems. Review of contemporary social work theories and practice approaches.

Precludes additional credit for SOWK 5305.

Prerequisite: registration in M.S.W. Year II.

SOWK 5308 [0.5 credit]

#### Direct Intervention

Presentation of a structural framework for social work theory and practice examining assessment and interventive approaches, analytical and interaction skills, helping process and social transformation. Explores interventions with individuals, families, small groups based on an understanding of class,

gender, race, age, ability and sexual orientation.

Precludes additional credit for SOWK 5304.

Prerequisite: registration in M.S.W. Year I.

SOWK 5405 [1.0 credit]

#### Research and Evaluation in Social Work

Addresses the logic of inquiry, and assesses quantitative and qualitative techniques. Attention to program and direct intervention evaluation especially with the use of action and participatory research approaches. May include research or evaluation project with community agencies and practitioners, or individual research proposal.

Prerequisite: registration in M.S.W. Year II.

SOWK 5408 [0.5 credit]

#### Social Administration and Policy

Knowledge and skills required for understanding, analyzing and practicing social policy development and administration in social work. Political, economic, and social context of policymaking, theoretical perspectives for developing policy, and contemporary social policy issues.

Precludes additional credit for SOWK 5304.

Prerequisite: registration in M.S.W. Year I.

SOWK 5501 [0.5 credit]

#### Theories in Social Science and Social Work

Examines relationships between theories in social science and in social work exploring connections to social work practice and emphasizing theories of inequality.

Precludes additional credit for SOWK 5500.

Prerequisite: registration in M.S.W. Year I.

SOWK 5502 [0.5 credit]

#### History of Social Welfare and Social Work

Historical development of social welfare policies and the Canadian welfare state. History of relationship of economy, family, welfare institutions and Canadian state. Focus on the origins and development of social work as a profession.

Precludes additional credit for SOWK 5500.

Prerequisite: registration in M.S.W. Year I.

SOWK 5504 [1.0 credit]

#### Directed Studies

Individual exploration of selected theoretical perspectives for social work practice under the direct supervision of a member of faculty or visiting scholar.

SOWK 5506 [0.5 credit]

#### Directed Studies

Individual exploration of selected theoretical perspectives for social work practice under the direct supervision of a member of faculty or visiting scholar.

SOWK 5606 [2.0 credits]

#### Practicum I

Integration of academic and practical aspects of social-work education. 475 hours of guided learning in a community-based setting. Field seminar required. Prerequisite: registration in M.S.W. Year I, and completion of or concurrent registration in SOWK 5308, SOWK 5408, SOWK 5501, SOWK 5502, and SOWK 5608.

SOWK 5607 [2.0 credits]

#### Practicum II

500 hours integrating advanced social work theories and practice. Field seminar required. Not usually available in the first term of registration.

Prerequisite: B.S.W. or completion of M.S.W. Year 1, and completion of SOWK 5306 or SOWK 5307; SOWK 5306 or SOWK 5307 may be taken concurrently with SOWK 5607 to fulfil this requirement.



SOWK 5608 [0.5 credit]

**Community Work**

Models and methods of community organization. Social-economic contexts and ideological approaches to social change work; social change efforts; globalization and corporate rule.

SOWK 5609 [0.5 credit]

**Community Development**

Approaches to community engagement, analysis, mobilization and evaluation; community development as a space for prefigurative politics necessary for social change. Historical and contemporary examination of community-based approaches to social justice.

SOWK 5700 [0.5 credit]

**Special Topics in Social Policy**

The School will offer courses on substantive topics related to social administration and policy. Topics vary depending on the interests of faculty and students and the availability of instructors. Students outside of the School may register with permission from the School.

SOWK 5701 [0.5 credit]

**Special Topics in Direct Intervention**

The School will offer courses on substantive topics related to direct intervention including community development. Topics vary depending on the interests of faculty and students and the availability of instructors. Students outside of the School may register with permission from the School.

SOWK 5702 [0.5 credit]

**Special Topics in Social Work**

The School will offer lecture courses on substantive topics related to social work and social welfare. Topics will vary each year depending on the interests of faculty and students. Students from outside the School of Social Work may register with permission of the School.

SOWK 5703 [0.5 credit]

**Special Topics in Social Work**

The School will offer lecture courses on substantive topics related to social work and social welfare. Topics will vary each year depending on the interests of faculty and students. Students from outside the School of Social Work may register with permission of the School.

SOWK 5704 [0.5 credit]

**Race, Culture and Social Work Practice**

Anti-racist framework for social work practice to analyze policy and practice issues. "Privilege" as a critical and essential component for understanding oppression based on race and culture. Complex intersections of race and culture with class, gender, age, and other dimensions.

SOWK 5705 [0.5 credit]

**Child Protection**

Child welfare policy and the organization of social work practice particularly in the Canadian context. A range of welfare provisions affecting children and families will be considered as well as direct child protection policies and practices.

SOWK 5706 [0.5 credit]

**Trauma and Memory**

Comprehensive examination of contemporary theories of trauma and memory. Advanced counseling interventions with survivors of psychological trauma; critical examination of case studies illustrating recent findings in treatments of psychological trauma and associated memory processes.

SOWK 5801 [0.5 credit]

**Feminist Social Work Practice with Individuals, Couples, and Families**

Theory and practice of feminist approaches to social work with individuals, couples and families. Issues of diversity, such as race, class, and gender. Problem-based learning approach.

SOWK 5804 [0.5 credit]

**Organizing for Social Change**

Hands-on introduction to theories, models, and methods of organizing for social change from grass roots groups to national coalitions. Practical skills for helping people mobilize to influence relevant social issues. Problem-based learning approach.

SOWK 5805 [0.5 credit]

**Social Development in the International Context**

International social development policies and practices from a cross-cultural perspective. Focus on international social policies and practices, and on economic, health, telecommunication, migration, and education policies and practices.

SOWK 5903 [1.0 credit]

**Independent Research Studies in Social Work**

Individually-arranged independent research study. Requires a written proposal that outlines a research project with clear learning objectives, and practice objectives (where relevant).

SOWK 5904 [0.5 credit]

**Independent Research Studies in Social Work**

Individually-arranged independent research study. Requires a written proposal that outlines a research project with clear learning objectives, and practice objectives (where relevant).

SOWK 5909 [2.0 credits]

**Thesis**

Prerequisite: registration in M.S.W. Year II.

## Sociology (SOCl)

### Department of Sociology and Anthropology

SOCl 5000 [0.5 credit]

#### Classical Sociological Theory

Crucial sociological concepts and ideas by the founders of sociology. Attention will be given to Marx, Weber, Durkheim, Pareto, Comte, and Husserl.

SOCl 5001 [0.5 credit]

#### Selected Topics in Classical Theory

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 5002 [0.5 credit]

#### Contemporary Sociological Theory

Major theoretical perspectives in sociology, including social behaviourism; social action theories such as symbolic interactionism, phenomenological sociology, ethnomethodology; and structuralist theories such as structural functionalism, neo-Marxism and critical theory.

SOCl 5003 [0.5 credit]

#### Selected Topics in Contemporary Theory

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 5005 [0.5 credit]

#### Recurring Debates in Social Thought

Recurring issues and debates in the discipline. Topics such as the nature of social science; the objective world versus social construction; questions of evidence, meaning and measurement; agency versus structure; the relation between research and praxis; knowledge and power, may be considered. Prerequisite: restricted to M.A. students in sociology. Others may be admitted by permission of the Department.

SOCl 5007 [0.5 credit]

#### Social Change and Economic Development

Critical examination of studies of change and development in historical and contemporary national and transnational systems.

SOCl 5009 [0.5 credit]

#### Philosophy of Social Science I

Philosophy of language and the basic elements of scientific method, such as the classification of the sciences, the concepts of value, cause and probability, induction and deduction, confirmation of hypotheses, and the concept of truth.

SOCl 5101 [1.0 credit]

#### Research Design and Data Analysis

An integrated approach to the problems involved in the analysis of quantitative data, research design and procedures.

SOCl 5102 [0.5 credit]

#### Statistical Methods I

A course on multiple regression analysis, with a review of basic statistical assumptions and techniques, followed by a detailed discussion of multiple regression analysis as a statistical technique.

SOCl 5103 [0.5 credit]

#### Statistical Methods II

The focus will be advanced research methods. Topics will include distributions, sampling distributions, hypothesis testing, and non-parametric methods. There will be an introduction to multivariate techniques, including regression and loglinear models.

SOCl 5104 [0.5 credit]

#### Multivariate Analysis

This course provides advanced instruction in methods and statistics. Consideration will be given to multiple regression, factor analysis, canonical analysis.

SOCl 5105 [0.5 credit]

#### Selected Topics in Social Research

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 5200 [0.5 credit]

#### Comparative Social Systems

Perspectives and research procedures employed by sociologists in the systematic and explicit comparison of data from two or more societies.

SOCl 5201 [0.5 credit]

#### Comparative Methods in Social Research

Current analytical problems and applications of comparative methods in social research. Students are expected to participate in a group research project in which one or more of these methods will be applied.

SOCl 5204 [0.5 credit]

#### Consuming Passions: The Regulation of Consumption, Appearance and Sexuality

Examination of the rise of consumption and private pleasures and their regulation and self-regulation. (Also listed as LAWS 5008.)

SOCl 5205 [1.0 credit]

#### Canadian Society

A critical examination of sociological models of modern societies and their relevance to Canada.

SOCl 5206 [0.5 credit]

#### Sociology of Occupations and Professions

A consideration of the development of occupational recruitment patterns and manpower problems in developed and developing areas.

SOCl 5207 [0.5 credit]

#### Sociology of Formal Organizations

A consideration of the forms and processes of bureaucracy in modern society, government and industry.

SOCl 5209 [0.5 credit]

#### Sociology of Science and Technology

Study of the interaction among science, technology and change in modern societies.

SOCl 5300 [0.5 credit]

#### Social Institutions I

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 5301 [0.5 credit]

#### Social Institutions II

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 5302 [0.5 credit]

#### The Labour Process

A consideration of the organization of work and production from feudal times to the present. The purpose of the course is to analyze the labour process in advanced capitalist societies by means of the historical comparative method.

SOCl 5303 [0.5 credit]

#### Sociology of Education

The relations between education and other social institutions, the structure of educational opportunity, educational systems and organizations, and the sociology of learning.

SOCI 5305 [0.5 credit]

**Police and Capital**

The idea of 'police' as a general historical project aimed at the fabrication of social order and the development of liberal philosophy, political economy and security. Contemporary public and private security provision considered in light of commodification, class conflict, and risk thinking. (Also listed as LAWS 5306)

SOCI 5306 [0.5 credit]

**Cultural Studies**

The relations between cultural practices and other social practices in definite social formations. Discussions are grounded through the choice of specific Canadian research on topics such as media, art, music, education, pedagogy, etc.

SOCI 5307 [0.5 credit]

**Psychoanalysis and Cultural Studies**

This course will examine the relationship between psychoanalytic and sociological theory, focussing on the work of feminist theorists.

SOCI 5308 [0.5 credit]

**Feminist Analyses**

Current theory and research in recent feminist analysis.

SOCI 5309 [0.5 credit]

**Cultural Theory**

A survey of developments in European and North American Marxist and Post-Marxist cultural theories of the past quarter century.

SOCI 5400 [0.5 credit]

**Political Sociology**

An examination of theoretical and empirical work on selected aspects of the state, politics and political behaviour, primarily in North America and Europe.

SOCI 5404 [0.5 credit]

**Race, Ethnicity and Class in Contemporary Societies**

Various theoretical approaches concerning the persistence and re-emergence of ethnic and/or racial groups are examined. Particular emphasis is given to the intersection and overlap of ethnicity and race with social class.

SOCI 5405 [0.5 credit]

**Power and Stratification**

An examination of theories of elite behaviour, social class, and ideology.

SOCI 5406 [0.5 credit]

**Citizenship and Globalization**

Examination of debates about the changing nature of citizenship in the context of globalization of capital, culture and peoples. Employing post-Marshallian, political economic, post-structuralist, post-colonial and feminist perspectives, the seminar explores the emergence of market-driven, hierarchical and cosmopolitan notions of citizenship and transnational identities.

SOCI 5407 [0.5 credit]

**Governmentality and Politics**

Examination of Foucault's concept of governmentality and work which has developed this idea, especially the relevance of governmentality for global political studies. Topics may include: sovereignty, biopolitics, technopolitics, neoliberalism and citizenship. Also listed as PSCI 5303. Also offered at the undergraduate level, with different requirements, as PSCI 4303, for which additional credit is precluded.

SOCI 5408 [0.5 credit]

**Feminism and Materialism**

Recent developments of feminist materialist theory and analyses. Topics may include: the gender division of labour; family and economy; gender and class; gender, race and ethnicity; sexuality; reproduction; theory and politics.

SOCI 5409 [0.5 credit]

**The Politics of Social Movements and the State**

Origins, ideologies, strategies and political implications of social and popular movements in North America and Western Europe. Attention is given to the peace, feminist, gay, ecology, and anti-racist movements, and the emergence of the New Right.

SOCI 5500 [0.5 credit]

**Gender Formation and State Formation**

The role of states in the formation of gender relations, in the context of class and race, and the production of gender as an aspect of state formation. The various levels of the state are conceived as both a site and object of gender politics.

SOCI 5504 [0.5 credit]

**Selected Problems in Political Economy I**

A selected topic from current research in political economy. As the topic varies from year to year, students should check with the Department regarding the current offering. (Also listed as PECO 5501 and PSCI 5501.)

SOCI 5505 [0.5 credit]

**Selected Problems in Political Economy II**

A selected topic from current research in political economy. As the topic varies from year to year, students should check with the Department regarding the current offering. (Also listed as PECO 5502 and PSCI 5502.)

SOCI 5600 [0.5 credit]

**Critical Discourse Analysis**

Examination of the relations between discourse, social semiotics, extradiscursive semiotics and social organization.

SOCI 5605 [0.5 credit]

**Demographic Analysis**

Intensive study of analytical strategies and techniques employed in demographic research. Attention is also given to mathematical and statistical models used in demography, which are relevant to research in other areas of sociology.

SOCI 5606 [0.5 credit]

**Selected Topics in Sociology**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCI 5607 [0.5 credit]

**Contemporary Theories of Crime and Social Regulation**

Recent developments in theories of criminality and social regulation. Particular reference will be made to the regulatory mechanisms of both public and private spheres within legal institutions, corrections, economic institutions, and the family.

SOCI 5608 [0.5 credit]

**Women and Work**

Issues concerning women and work, such as housework, occupational segregation, part-time work, the changing economic structure of work, wage inequality, and state policies with respect to childcare, equal pay and work of equal value, and affirmative action.

SOCl 5707 [0.5 credit]

**Crime, Social Control and Social Change**

An examination of the role of the discourses and ideologies surrounding crime, criminal processes, and social change. Topics may include such issues as juvenile justice, victimization, corporate crime, criminalization of indigenous peoples, substance use and abuse.

SOCl 5802 [0.5 credit]

**Departmental Seminar**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 5803 [0.5 credit]

**Critical Theory**

Recent developments in critical theory based upon its initial formulation by the Frankfurt School, with emphasis upon particular contemporary theories in a given year, e.g., J. Habermas, H. Willems, etc.

SOCl 5804 [0.5 credit]

**Modern Marxist Theory**

An examination of topics of theory and research in modern Marxist literature; the central focus is on problems of class analysis, the state, and politics in advanced capitalist societies.

SOCl 5805 [0.5 credit]

**Selected Topics in Sociology**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 5806 [0.5 credit]

**Selected Topics in Sociology**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 5809 [0.5 credit]

**The Logic of the Research Process**

An examination of the research process, including the phases of conceptualization, choice of indicators, sampling, data collection, and analysis. Published articles will be studied as exemplars of the range of possible research strategies.

SOCl 5900 [0.5 credit]

**Tutorial**

SOCl 5905 [2.0 credits]

**Course Work Comprehensive in Sociology**

Available for students in a course work M.A. who by the third term in their M.A. program have not yet completed their written and oral examinations. Completion of this course does not reduce the formal requirement of 5.0 credits.

SOCl 5907 [0.5 credit]

**Placement in Sociology**

This course is required for students in the Concentration in Quantitative Methodology who have been admitted into the Cooperative Education option. This option provides an opportunity to enhance educational experience through work placement.

SOCl 5908 [1.0 credit]

**M.A. Research Essay**

Students may enrol in this course for a maximum of three consecutive terms of study, including one summer term. Students must enrol in this course not later than the beginning of the second full year of study.

SOCl 5909 [2.0 credits]

**M.A. Thesis**

SOCl 6000 [1.0 credit]

**Doctoral Seminar**

An in-depth study of current research in sociology, including an inquiry into research techniques, conceptualization and attendant theoretical issues. This course is required of all first-year doctoral students in sociology.

SOCl 6001 [0.5 credit]

**Selected Topics in Sociology**

Topic varies from year to year. Students should check with the Department regarding the topic offered.

SOCl 6900 [0.5 credit]

**Tutorial**

SOCl 6909 [7.0 credits]

**Ph.D. Thesis**



## Statistics (STAT)

### School of Mathematics and Statistics

STAT 5500 [0.5 credit] (MAT 5177)

#### Multivariate Normal Theory

Multivariate normal distribution properties, characterization, estimation of means, and covariance matrix. Regression approach to distribution theory of statistics; multivariate tests; correlations; classification of observations; Wilks' criteria. Prerequisite: STAT 3559.

STAT 5501 [0.5 credit] (MAT 5191)

#### Mathematical Statistics II

Confidence intervals and pivotals; Bayesian intervals; optimal tests and Neyman-Pearson theory; likelihood ratio and score tests; significance tests; goodness-of-fit-tests; large sample theory and applications to maximum likelihood and robust estimation. Also offered, with different requirements, as STAT 4507 for which additional credit is precluded.

Prerequisite: STAT 4500 or STAT 5600 or permission of the School.

STAT 5502 [0.5 credit] (MAT 5192)

#### Sampling Theory and Methods

Unequal probability sampling with and without replacement; unified theory for standard errors; prediction approach; ratio and regression estimation; stratification and optimal designs; multistage cluster sampling; double sampling; domains of study; post-stratification; nonresponse; measurement errors; related topics. Prerequisite: STAT 4502 or permission of the School.

STAT 5503 [0.5 credit] (MAT 5193)

#### Linear Models

Theory of non full rank linear models; estimable functions, best linear unbiased estimators, hypotheses testing, confidence regions; multi-way classifications; analysis of covariance; variance component models; maximum likelihood estimation, Minque, Anova methods; miscellaneous topics. Prerequisite: STAT 4500 or STAT 5600 or permission of the School.

STAT 5504 [0.5 credit] (MAT 5194)

#### Stochastic Processes and Time Series Analysis

Stationary stochastic processes, inference for stochastic processes, applications to time series and spatial series analysis.

Prerequisite: STAT 4501 or permission of the School.

STAT 5505 [0.5 credit] (MAT 5195)

#### Design of Experiments

Overview of linear model theory; orthogonality; randomized block and split plot designs; latin square designs; randomization theory; incomplete block designs; factorial experiments: confounding and fractional replication; response surface methodology. Miscellaneous topics.

Prerequisite: STAT 3553 and STAT 4504 or STAT 4500 or STAT 5600 or permission of the School.

STAT 5506 [0.5 credit] (MAT 5175)

#### Robust Statistical Inference

Tests for location, scale, and regression parameters; derivation of rank tests; distribution theory of linear rank statistics and their efficiency. Robust estimation of location, scale and regression parameters; Huber's M-estimators, Rank-methods, L-estimators. Influence function. Adaptive procedures.

Prerequisite: STAT 4500 or STAT 5600 or permission of the School.

STAT 5507 [0.5 credit] (MAT 5176)

#### Advanced Statistical Inference

Pure significance test; uniformly most powerful unbiased and invariant tests; asymptotic comparison of tests; confidence intervals; large-sample theory of likelihood ratio and chi-square tests; likelihood inference; Bayesian inference; fiducial and structural methods; resampling methods.

Prerequisite: STAT 4507 or STAT 5501 or permission of the School.

STAT 5508 [0.5 credit] (MAT 5172)

#### Topics in Stochastic Processes

Course contents will vary, but will include topics drawn from Markov processes. Brownian motion, stochastic differential equations, martingales, Markov random fields, random measures, and infinite particle systems, advanced topics in modeling, population models, etc.

Prerequisites: STAT 3506 or STAT 4501, or permission of the School.

STAT 5509 [0.5 credit] (MAT 5196)

#### Multivariate Analysis

Multivariate methods of data analysis, including principal components, cluster analysis, factor analysis, canonical correlation, MANOVA, profile analysis, discriminant analysis, path analysis. Also offered at the undergraduate level, with different requirements, as MATH 4503, for which additional credit is precluded.

Prerequisite: STAT 4500 or STAT 5600 or permission of the School.

STAT 5600 [0.5 credit] (MAT 5190)

#### Mathematical Statistics I

Statistical decision theory; likelihood functions; sufficiency; factorization theorem; exponential families; UMVU estimators; Fisher's information; Cramer-Rao lower bound; maximum likelihood, moment estimation; invariant and robust point estimation; asymptotic properties; Bayesian point estimation. Also offered, with different requirements, as MATH 4500 for which additional credit is precluded.

Prerequisite: STAT 3559 or permission of the School.

STAT 5601 [0.5 credit] (MAT 5197)

#### Stochastic Optimization

Topics chosen from stochastic dynamic programming, Markov decision processes, search theory, optimal stopping. Also offered at the undergraduate level, with different requirements, as STAT 4509, for which additional credit is precluded.

Prerequisite: STAT 3506 or permission of the School.

STAT 5602 [0.5 credit] (MAT 5317)

#### Analysis of Categorical Data

Analysis of one-way and two-way tables of nominal data; multi-dimensional contingency tables, log-linear models; tests of symmetry, marginal homogeneity in square tables; incomplete tables; tables with ordered categories; fixed margins, logistic models with binary response; measures of association and agreement.

Prerequisites: STAT 4500 or STAT 5600, STAT 4507 or STAT 5501, or permission of the School.

STAT 5603 [0.5 credit] (MAT 5318)

#### Reliability and Survival Analysis

Types of censored data; nonparametric estimation of survival function; graphical procedures for model identification; parametric models and maximum likelihood estimation; exponential and Weibull regression models; nonparametric hazard function models and associated statistical inference; rank tests with censored data applications.

Prerequisites: STAT 4500 or STAT 5600, STAT 4507 or STAT 5501 or permission of the School.

STAT 5604 [0.5 credit] (MAT 5173)

**Stochastic Analysis**

Brownian motion, continuous martingales, and stochastic integration.

Prerequisites: STAT 4501 or STAT 5708 or permission of the School.

STAT 5610 [0.5 credit] (MAT 5375)

**Introduction to Mathematical Statistics**

Limit theorems. Sampling distributions. Parametric estimation. Concepts of sufficiency and efficiency. Neyman-Pearson paradigm, likelihood ratio tests. Parametric and non-parametric methods for two-sample comparisons. Notions of experimental design, categorical data analysis, the general linear model, decision theory and Bayesian inference.

Precludes additional credit for STAT 5600.

Prerequisite: STAT 3553 and STAT 2559 or permission of the School.

STAT 5701 [0.5 credit] (MAT 5198)

**Stochastic Models**

Markov systems, stochastic networks, queuing networks, spatial processes, approximation methods in stochastic processes and queuing theory. Applications to the modeling and analysis of computer-communications systems and other distributed networks. Also offered, with different requirements, as STAT 4508 for which additional credit is precluded.

Prerequisite: STAT 3506 or permission of the School.

STAT 5702 [0.5 credit] (MAT 5182)

**Modern Applied and Computational Statistics**

Resampling and computer intensive methods: bootstrap, jackknife with applications to bias estimation, variance estimation, confidence intervals, and regression analysis. Smoothing methods in curve estimation; statistical classification and pattern recognition: error counting methods, optimal classifiers, bootstrap estimates of the bias of the misclassification error.

Prerequisite: permission of the instructor.

STAT 5703 [0.5 credit] (MAT 5181)

**Data Mining**

Visualization and knowledge discovery in massive datasets; unsupervised learning: clustering algorithms; dimension reduction; supervised learning: pattern recognition, smoothing techniques, classification. Computer software will be used.

Prerequisite: permission of the instructor.

STAT 5704 [0.5 credit] (MAT 5174)

**Network Performance**

Advanced techniques in performance evaluation of large complex networks. Topics may include classical queueing theory and simulation analysis; models of packet networks; loss and delay systems; blocking probabilities.

Prerequisite: some familiarity with probability and stochastic processes and queueing, or permission of the instructor.

STAT 5708 [0.5 credit] (MAT 5170)

**Probability Theory I**

Probability spaces, random variables, expected values as integrals, joint distributions, independence and product measures, cumulative distribution functions and extensions of probability measures, Borel-Cantelli lemmas, convergence concepts, independent identically distributed sequences of random variables.

Prerequisites: MATH 3001, and STAT 3558 is strongly recommended, or permission of the School.

STAT 5709 [0.5 credit] (MAT 5171)

**Probability Theory II**

Laws of large numbers, characteristic functions, central limit theorem, conditional probabilities and expectations, basic properties and convergence theorems for martingales, introduction to Brownian motion.

Prerequisite: STAT 5708 (MAT 5170) or permission of the School.

STAT 5902 [0.5 credit] (MAT 5992)

**Seminar in Biostatistics**

Students work in teams on the analysis of experimental data or experimental plans. The participation of experimenters in these teams is encouraged. Student teams present their results in the seminar, and prepare a brief written report on their work.

STAT 5904 [0.5 credit]

**Statistical Internship**

This project-oriented course allows students to undertake statistical research and data analysis projects as a cooperative project with governmental or industrial sponsors. Practical data analysis and consulting skills will be emphasized. The grade will be based upon oral and written presentation of results.

Prerequisite: permission of the Institute.

## Strategic Management (STGY)

### Sprott School of Business

STGY 5900 [0.5 credit]

#### Corporate and Business Strategy

Strategic management focuses on the evaluation of environmental opportunities and threats in the external environment and the analysis of strengths and weaknesses in the organization's value chain, in order to determine core competencies as the foundation for a sustainable competitive advantage. Company Capstone Project required.

Precludes additional credit for STGY 5901 and STGY 5902.

Prerequisite: all MBA core courses must be completed with grade of B- or better.

STGY 5901 [0.25 credit]

#### Corporate and Business Strategy

Strategic analysis, formulation and implementation. Strategic management emphasizes the determination and evaluation of environmental opportunities and threats in light of strengths and weaknesses in the organization's value chain using VRIO in order to enhance its core competencies and craft a sustainable competitive advantage.

Precludes additional credit for BUSI 5808.

STGY 5902 [0.25 credit]

#### Strategic Management Capstone Project

Research and analyze a firm according to principles of STGY 5901 course. Using Factiva, Mergent, Hoovers, Bloomberg, Statistics Canada, US Census Bureau, industry associations, SEC, SEDAR, identify and analyze data to construct case study and analysis of corporate and business strategies of a single firm.

Precludes additional credit for BUSI 5808.

## Sustainable Energy (SERG)

Department of Electronics

Department of Mechanical and Aerospace Engineering

School of Public Policy and Administration

Department of Systems and Computer Engineering

SERG 5000 [0.5 credit]

#### Cross Disciplinary Course in Sustainable Energy

This course integrates concepts and frameworks drawn from engineering and policy studies appropriate to sustainable energy, using case studies to introduce the challenges of interdisciplinary work in sustainable energy. (Also listed as PADM 5500)

Prerequisite: SERG 5001 or SERG 5002.

SERG 5001 [0.5 credit]

#### Sustainable Energy Policy for Engineers

This course introduces engineering students to the policy world by examining political and policy institutions, and covering basic principles of policy analysis, as they relate to the energy realm.

SERG 5002 [0.5 credit]

#### Sustainable Energy Engineering for Policy Students

This course introduces policy students to fundamental principles of engineering, particularly as they relate to energy production, transformation and consumption.

SERG 5800 [0.0 credit]

#### Sustainable Energy Seminar

This course takes the form of a series of seminars presented by graduate students and other researchers in the area of sustainable energy. To complete this course, a student must attend at least ten seminars and make one presentation.

SERG 5906 [0.5 credit]

#### Directed Studies in Sustainable Energy

A directed course on selected subjects related to sustainable energy as approved by a course supervisor.

## Systems and Computer Engineering (SYSC)

### Department of Systems and Computer Engineering

SYSC 5001 [0.5 credit] (ELG 6101)

#### Simulation and Modeling

Simulation as a problem solving tool. Random variable generation, general discrete simulation procedure: event table and statistical gathering. Analyses of simulation data: point and interval estimation. Confidence intervals. Overview of modeling, simulation and problem solving using SIMSCRIPT, MODSIM and other languages.

SYSC 5003 [0.5 credit] (ELG 6103)

#### Discrete Stochastic Models

Models for software, computer systems, and communications networks, with discrete states, instantaneous transitions and stochastic behaviour. Communicating finite state machines and Petri Nets. Review of concepts of probability, and of Markov Chains with discrete and continuous parameters. Basic queuing theory. Numerical methods for Markov Models.

SYSC 5004 [0.5 credit] (ELG 6104)

#### Optimization for Engineering Applications

Introduction to algorithms and computer methods for optimizing complex engineering systems. Includes linear programming, networks, nonlinear programming, integer and mixed-integer programming, genetic algorithms and search methods, and dynamic programming. Emphasizes practical algorithms and computer methods for engineering applications.

SYSC 5005 [0.5 credit] (ELG 6105)

#### Optimization Theory and Methods

Advanced theory, algorithms and computer methods for optimization. Interior point methods for linear optimization, advanced methods for nonlinear and mixed-integer optimization. Search methods. Applications in engineering.

Prerequisite: SYSC 5004 (ELG 6104) or equivalent.

SYSC 5006 [0.5 credit] (ELG 6106)

#### Design of Real-Time and Distributed Systems

Characteristics of real-time and distributed systems. Modern middleware systems, such as CORBA, DCE, RMI for building distributed applications: advantages and disadvantages. Analyzing designs for robustness, modularity, extensibility, portability and performance. Implementation issues. Major course project.

Prerequisites: SYSC 3303 and SYSC 5708 (ELG 6178) or similar experience.

SYSC 5007 [0.5 credit] (ELG 6107)

#### Expert Systems

Survey of some landmark expert systems; types of architecture and knowledge representation; interferencing techniques; approximate reasoning; truth maintenance; explanation facilities; knowledge acquisition. A project to implement a small expert system will be assigned. (Also listed as COMP 5007) Prerequisite: COMP 4007 or COMP 5001 (CSI 5113) or permission of the Department.

SYSC 5101 [0.5 credit] (ELG 6111)

#### Design of High Performance Software

Designing software to demanding performance specifications. Design analysis using models of computation, workload, and performance. Principles to govern design improvement for sequential, concurrent and parallel execution, based on resource architecture and quantitative analysis.

Prerequisite: SYSC 5704 (ELG 6174) and a course in software engineering, or equivalent.

SYSC 5102 [0.5 credit] (ELG 6112)

#### Performance Measurement and Modeling of Distributed Applications

Performance measurements, metrics and models of middleware based systems and applications. Benchmarks, workload characterization, and methods for capacity planning and system sizing. Performance monitoring infrastructures for operating systems and applications. Introduction to the design and analysis of experiments and the interpretation of measurements.

Prerequisite: SYSC 5101 (ELG 6611) or equivalent.

SYSC 5103 [0.5 credit] (ELG 6113)

#### Software Agents

Agent-based programming; elements of Distributed Artificial Intelligence; beliefs, desires and intentions; component-based technology; languages for agent implementations; interface agents; information sharing and coordination; KIF; collaboration; communication; ontologies; KQML; autonomy; adaptability; security issues; mobility; standards; agent design issues and frameworks, applications in telecommunications.

Prerequisite: Knowledge of Java, C/C++ or Smalltalk.

SYSC 5104 [0.5 credit] (ELG 6114)

#### Methodologies For Discrete-Event Modeling And Simulation

Methodological aspects of simulation. Modeling discrete events systems. Modeling formalisms: FSA, FSM, Petri Nets, DEVS, others. Verification and validation. Cellular models: Cellular Automata, Cell-DEVS. Continuous and hybrid models. Parallel and Distributed simulation (PADS) techniques. PADS middleware: HLA, Parallel-DEVS, Time-Warp.

Prerequisites: knowledge of C++ and of basic concepts of concurrency and distributed systems.

SYSC 5105 [0.5 credit] (ELG 6115)

#### Software Quality Engineering and Management

All aspects of software quality engineering. Software testing, at all stages of the software development and maintenance life cycle. Software reviews and inspections. Use of software measurement and quantitative modeling for the purpose of software quality control and improvement.

Precludes additional credit for CSI 5111 (COMP 5501). Prerequisites: an undergraduate course in software engineering such as SYSC 4800 or SEG 3300, or equivalent, and basic statistics.

SYSC 5108 [0.5 credit] (ELG 6118)

#### Topics in Information Systems

Recent and advanced topics in the field of Information Systems and its related areas.

SYSC 5109 [0.5 credit] (ELG 6119)

#### Teletraffic Engineering

Congestion phenomena in telephone systems, and related telecommunications networks and systems, with an emphasis on the problems, notation, terminology, and typical switching systems and networks of the operating telephone companies. Analytical queuing models and applications to these systems.

Prerequisite: SYSC 5503 (ELG 5503) or ELG 5119 (EACJ 5109) or equivalent.



SYSC 5135 [0.5 credit] (ELG 6305)

**Ethics, Research Methods and Standards**

Ethical theories and decision-making, codes; human and animal experimentation, consent, ethical review boards; research methods and regulations for design, manufacture, certification of medical devices; data collection, management, analysis, including security, confidentiality, privacy; bioethical dilemmas, impact of technology and research.

Precludes additional credit for BIOM 5002 (BMG 5102), EACJ 6132 (ELG 6132), and SYSC 4201.

SYSC 5200 [0.5 credit] (ELG 6120)

**Algebraic Coding Theory**

Review of Algebra, Finite Fields, Linear Block Codes and their Properties, Hamming Codes, Cyclic Codes, Hadamard Matrices and Hadamard Codes, Golay Codes, Reed-Muller Codes, BCH and Reed-Solomon Codes, Decoding Algorithms, Coding Bounds.

Precludes additional credit for SYSC 5507 (ELG 6157).

SYSC 5201 [0.5 credit] (ELG 6121)

**Computer Communication**

Computer network types, introductory queuing theory and performance analysis. OSI layering and BISDN layering modifications. Data link layer. Local area networks and random access (CSMA- CD, switched ethernet, token ring, wireless LAN). Public Networks. IP networks, addressing, routing. Transport layer, flow control. Introduction to ISDN.

Precludes additional credit for EACJ 5607 (ELG 5374) or SYSC 4602 (ELG 4181).

Prerequisite: Undergraduate preparation in probability theory equivalent to STAT 3502.

SYSC 5207 [0.5 credit] (ELG 6127)

**Distributed Systems Engineering**

Techniques for representing distributed systems: graphical and textual models. Processes, threads, synchronization and inter-process communication techniques, RPC. Middleware: client-server (CORBA), grids, Web services. Resource management: processor allocation, load sharing, Grid scheduling, real-time issues. Protocol: OSI model, application and presentation layers.

Prerequisite: permission of the Department.

SYSC 5300 [0.5 credit] (ELG 6130)

**Advanced Health Care Engineering**

Healthcare and technology; overview of medical devices and sensors; safe and effective use and management of technology; telemedicine; medical databases, data collection, storage, retrieval and computers in medicine; electronic patient records, PACS; clinical decision-support systems.

Precludes additional credit for ELG 5123 (EACJ 5303) and ELG 6130 (SYSC5300).

Prerequisite: permission of the instructor.

SYSC 5301 [0.5 credit] (ELG 6131)

**Advanced Topics in Biomedical Engineering**

Topics vary from year to year. Also offered as EACJ 5127 (ELG 6131).

Prerequisite: permission of the Department.

SYSC 5302 [0.5 credit] (ELG 6321)

**Biomedical Instrumentation**

Instrumentation designed to measure physiological variables related to the function of the heart, lungs, kidney, nervous and musculo-skeletal system; emergency, critical care, surgery and anaesthesia equipment.

Precludes additional credit for BIOM 5100 (BMG 5103).

Prerequisite: permission of the instructor.

Also offered as EACJ 5302 (ELG 6321).

SYSC 5303 [0.5 credit] (ELG 6133)

**Interactive Networked Systems and Telemedicine**

Telemanipulator; human motoring and sensory capabilities; typical interface devices; mathematical model of haptic interfaces; haptic rendering; stability and transparency; remote control schemes; time delay compensation; networking and realtime protocols, history and challenges of telemedicine; telemedicine applications: telesurgery, telemonitoring, telediagnosis and telehomecare.

Prerequisite: permission of the Department.

SYSC 5304 [0.5 credit] (ELG 5127)

**Medical Image Processing**

Mathematical models of image formation based on the image modality and tissue properties. Linear models of image degradation and reconstruction. Inverse problems and regularization for image reconstruction. Image formation in radiology, computed tomography, magnetic resonance imaging, nuclear medicine, ultrasound, positron emission tomography, electrical impedance tomography.

Also offered as EACJ 5304.

Precludes additional credit for EACJ 5601 (ELG 7173) if EACJ 5601 was taken as this topic.

Prerequisites: one of ELG 4172, CEG 4311, SYSC 4405 or permission of the Department.

SYSC 5306 [0.5 credit] (ELG 6136)

**Mobile Computing Systems**

Systems to build mobile applications. Covers data link layer to application layer. Emphasis on existing wireless infrastructure and IETF protocols. Focuses on view of mobile application developer; communication systems, middleware and application frameworks, defacto standards proposed/developed by industry consortia.

Precludes additional credit for COMP 5402 (CSI 5142).

Prerequisites: EACJ 5607 (ELG 5374) or SYSC 5201 (ELG 6121) or permission of the Department.

SYSC 5307 [0.5 credit] (ELG 6307)

**Biological Signals**

Modeling of neuromuscular biological signals, including subthreshold phenomena, active behaviour of cell membranes, and innervation processes. Measurement of biological signals, including electrode effects. Time domain, frequency domain, and adaptive filtering techniques for noise reduction.

Precludes additional credit for BIOM 5101 (BMG 5104).

SYSC 5370 [0.5 credit] (ELG 5370)

**Multiresolution Signal Decomposition: Analysis and Applications**

Multirate signal processing: sampling rate conversion, polyphase representation. Bases, filter banks: series expansion of discrete-time signals, series expansion of continuous-time signals, multiresolution concept and analysis, construction of wavelet, wavelet series. Complexity of multirate discrete-time processing, filter banks, and wavelet series computation.

SYSC 5401 [0.5 credit] (ELG 6141)

**Adaptive and Learning Systems**

System identification. Least squares and recursive identification techniques. Asymptotic and theoretical properties. Model structure selection. Prediction and estimation. Model reference adaptive control and self-tuning regulators. Nonlinear adaptive systems. Stability. Neural networks and neuro-control. Applications to robotics, control and pattern recognition.

Prerequisite: SYSC 5502 (ELG 6152) or equivalent.

SYSC 5402 [0.5 credit] (ELG 6142)

**Advanced Dynamics With Applications to Robotics**  
Lagrange equations and Hamilton's principle. Dynamics of lumped parameter and continuous systems. Natural modes and natural frequencies. Forced vibrations. Stability and bifurcation. Kinematics and dynamics of rigid bodies. Gyroscopic effects. Forward and inverse kinematics of robot manipulators. Denavit-Hartenberg notation. Derivation of manipulator dynamics.

SYSC 5403 [0.5 credit] (ELG 6143)

**Network Access Techniques**

A range of access technologies with emphasis on broadband access. Physical channels and the state-of-the-art of coding, modulation, multiplexing strategies to overcome physical impairments. including high-speed transmission over twisted pair, wireless, fibre and co-axial media.

Prerequisites: SYSC 5503 (ELG 6153), and SYSC 5504 (ELG 6154) or ELG 5375 (EACJ 5506).

SYSC 5405 [0.5 credit] (ELG 6102)

**Pattern Classification and Experiment Design**

Introduction to a variety of supervised and unsupervised pattern classification techniques with emphasis on correct application. Statistically rigorous experimental design and reporting of performance results. Case studies will be drawn from various fields including biomedical informatics. (Also listed as BIOM 5405.)

Prerequisite: undergraduate introductory probability and statistics.

SYSC 5502 [0.5 credit] (ELG 6152)

**Advanced Linear Systems**

Modeling and state space realization. Review of signals and systems. Solution to the matrix DE. Discrete time systems and the Z transform. Canonical representations and transformations. Controllability, observability and controller and observer design. LQR design and the Kalman filter. Numerous examples and applications.

SYSC 5503 [0.5 credit] (ELG 6153)

**Stochastic Processes**

Basic concepts of randomness, as applied to communications, signal processing, and queuing systems; probability theory, random variables, stochastic processes; random signals in linear systems; introduction to decision and estimation; Markov chains and elements of queuing theory. Precludes additional credit for EACJ 5109 (ELG 5119).

SYSC 5504 [0.5 credit] (ELG 6154)

**Principles of Digital Communication**

Elements of communication theory and information theory applied to digital communications systems. Characterization of noise and channel models. Optimum Receiver theory. Modulation and coding for reliable transmission: MPSK, MQAM, M-ary orthogonal modulation. Channel coding, trellis coded modulation. Spread spectrum and CDMA communications.

Precludes additional credit for EACJ 5506 (ELG 5375). Prerequisite: SYSC 5503 (ELG 5503) or ELG 5119 (EACJ 5109) or equivalent (may be taken concurrently).

SYSC 5506 [0.5 credit] (ELG 5170)

**Information Theory**

Measure of information: entropy, relative entropy, mutual information, asymptotic equipartition property, entropy rates for stochastic processes; data compression: Huffman code, arithmetic coding; channel capacity: random coding bound, reliability function, Blahut-Arimoto algorithm, Gaussian channels, coloured Gaussian noise and 'water-filling'; rate distortion theory; network information theory. Prerequisite: SYSC 5503 (ELG 6153) or EACJ 5109 (ELG 5119) or equivalent.

Precludes credit for EACJ 5501 (ELG 5170).

SYSC 5508 [0.5 credit] (ELG 6158)

**Digital Systems Architecture**

New architectural concepts are introduced. Discussion of programmable architectures (micro-controllers, DSPs, GP) and FPGAs. Memory interfacing. Scalable, superscalar, RISC, CISC, and VLIW concepts. Parallel structures: SIMD, MISD and MIMD. Fault tolerant systems and DSP architectures. Examples of current systems are used for discussions.

Prerequisite: SYSC 4507 or equivalent.

SYSC 5600 [0.5 credit] (ELG 6160)

**Adaptive Signal Processing**

Theory and techniques of adaptive filtering, including Wiener filters, gradient and LMS methods; adaptive transversal and lattice filters; recursive and fast recursive least squares; convergence and tracking performance; implementation. Applications, such as adaptive prediction, channel equalization, echo cancellation, source coding, antenna beamforming, spectral estimation.

Precludes additional credit for EACJ 5800 (ELG 5377).

Prerequisites: SYSC 5503 (ELG 6153) or ELG 5119 (EACJ 5109) or equivalent; SYSC 5602 (ELG 6162) or ELG 5376 (EACJ 5507) or equivalent.

SYSC 5601 [0.5 credit] (ELG 6161)

**Neural Signal Processing**

Multidimensional function approximation. The least squares adaptive algorithm and the generalized delta rule. Multi-layered perceptrons and the back-propagation algorithm. Approximation of non-linear functions. Radial basis functions. Self-organizing maps. Applications of neural signal processing to control, communications and pattern recognition.

Precludes additional credit for EACJ 5709 (ELG 5796).

Prerequisite: SYSC 5503 (ELG 6153) or equivalent. May be taken concurrently with SYSC 5503 (ELG 5503).

SYSC 5602 [0.5 credit] (ELG 6162)

**Digital Signal Processing**

Review of discrete time signals and systems, A/D and D/A conversions, representation in time, frequency, and Z domain, DFT/FFT transforms, FIR/IIR filter design, quantization effects. Correlation functions. Cepstrum analysis. Multi-rate signal processing. Power spectrum estimation. Introduction to joint time-frequency analysis. DSP architecture: implementation approaches. Applications.

Precludes additional credit for EACJ 5507 (ELG 5376).

SYSC 5603 [0.5 credit] (ELG 6163)

**Digital Signal Processing: Microprocessors, Software and Applications**

Characteristics of DSP algorithms and architectural features of current DSP chips: TMS320, DSP-56xxx, AD-21xxx and SHARC. DSP multiprocessors and fault tolerant systems. Algorithm/software/hardware architecture interaction, program activity analysis, development cycle, and design tools. Case studies: LPC, codecs, FFT, echo cancellation, Viterbi decoding. Prerequisite: SYSC 5602 (ELG 6162) or ELG 5376 (EACJ 5507) or equivalent.

SYSC 5604 [0.5 credit] (ELG 6164)

**Advanced Topics in Digital Signal Processing**

Recent and advanced topics in the field of digital signal processing and its related areas.

Prerequisites: SYSC 5602 (ELG 6162) or ELG 5376 (EACJ 5507) or equivalent.

SYSC 5605 [0.5 credit] (ELG 6165)

**Advanced Digital Communication**

Techniques and performance of digital signalling and equalization over linear bandlimited channels with additive Gaussian noise. Fading multipath channels: diversity concepts, modeling and error probability performance evaluation. Synchronization in digital communications. Spread spectrum in digital transmission over multipath fading channels. Prerequisite: SYSC 5504 (ELG 6154) or equivalent.

SYSC 5606 [0.5 credit] (ELG 6166)

**Introduction to Mobile Communications**

Mobile radio channel characterization: signal strength prediction techniques and statistical coverage; fading; delay spread; interference models and outage probabilities. Digital modulation and transmission system performance. Signal processing techniques: diversity and beamforming, adaptive equalization, coding. Applications to TDMA and CDMA cellular systems. Prerequisite: SYSC 5503 (ELG 5503) and SYSC 5504 (ELG 6154) (may be taken concurrently with SYSC 5606).

SYSC 5607 [0.5 credit] (ELG 6167)

**Source Coding and Data Compression**

Discrete and continuous sources. Discrete sources: Huffman coding & run length encoding. Continuous sources: waveform construction coding; PCM, DPCM, delta modulation; speech compression by parameter extraction; predictive encoding; image coding by transformation and block quantization. Fourier and Walsh transform coding. Applications to speech, television, facsimile. Prerequisite: SYSC 5503 (ELG 5503) or ELG 5119 (EACJ 5109) or equivalent.

SYSC 5608 [0.5 credit] (ELG 6168)

**Wireless Communications Systems Engineering**

Multi-user cellular and personal radio communication systems; frequency reuse, traffic engineering, system capacity, mobility and channel resource allocation. Multiple access principles, cellular radio systems, signalling and interworking. Security and authentication. Wireless ATM, satellite systems, mobile location, wireless LANs, wireless local loops, broadband wireless, etc. Prerequisites: SYSC 5503 (ELG 5503) or ELG 5119 (EACJ 5109), and SYSC 5504 (ELG 6154) or ELG 5375 (EACJ 5506), or their equivalents. May be taken concurrently.

SYSC 5609 [0.5 credit] (ELG 6169)

**Digital Television**

Television standards: NTSC, PAL, SECAM, and HDTV. Sampling and quantization of television signals: rec 601-1. Digital video compression: inter and intra-frame methods, spatial and transform/wavelet coding; H.261 and MPEG standards. Video conferencing systems and other digital video processing applications.

SYSC 5700 [0.5 credit] (ELG 6170)

**Spread Spectrum Systems**

Types of spread spectrum systems, FH, DS-SS, TH-SS using impulse-radio. Hybrid DS/FH-SS. Pseudo-noise generators: statistical properties of M sequences, Galois field connections, Gold codes, OVFSF codes. Code tracking loops, initial synchronization of receiver spreading code. Performance in interference environments and fading channels. CDMA systems. SS applications in UWB communications and Imaging systems. Prerequisite: SYSC 5504 (ELG 6154) or equivalent.

SYSC 5701 [0.5 credit] (CSI 5117)

**Operating System Methods for Real-Time Applications**

Principles and methods for operating system design with application to real-time, embedded systems. Concurrent programming: mechanisms and languages; design approaches and issues; run-time support (kernel). Methods for hard real-time applications. Methods for distributed systems. Programming assignments in a suitable programming language. Prerequisites: SYSC 3303 or SYSC 5704 (ELG 6174) or equivalent courses and/or experience. Programming experience in high level and assembly languages.

SYSC 5703 [0.5 credit] (ELG 6173)

**Integrated Database Systems**

Database definitions, applications, architectures. Conceptual design based on entity-relationship, object-oriented models. Relational data model: relational algebra and calculus, normal forms, data definition and manipulation languages. Database management systems: transaction management, recovery and concurrency control. Current trends: object-oriented, knowledge-based, multimedia, distributed databases.

SYSC 5704 [0.5 credit] (ELG 6174)

**Elements of Computer Systems**

Concepts in basic computer architecture, assembly languages, high level languages including object orientation, compilers and operating system concepts (including concurrency mechanisms such as processes and threads and computer communication). Designed for graduate students without extensive undergraduate preparation in computer system engineering (or equivalent experience). Prerequisites: programming experience with at least one high level language and permission of the Department.

SYSC 5706 [0.5 credit] (ELG 6176)

**Analytical Performance Models of Computer Systems**

Analytical modeling techniques for performance analysis of computing systems. Theoretical techniques covered include single and multiple class queuing network models, together with a treatment of computational techniques, approximations, and limitations. Applications include scheduling, memory management, peripheral devices, databases, multiprocessing, and distributed computing. Prerequisite: SYSC 5003 (ELG 6103), SYSC 5503 (ELG 5503) or ELG 5119 (EACJ 5109), or equivalent.

SYSC 5708 [0.5 credit] (ELG 6178)

**Model-Driven Development of Real-Time and Distributed Software**

Advanced development of real-time and distributed systems by model-driven development that shifts the focus from coding to modeling. Different types of models. Generating code by model transformations. Design patterns for distributed/concurrent systems with examples from communication applications. Design issues for reusable software. Prerequisites: knowledge of UML and operating systems concepts, and permission of the Department.

SYSC 5709 [0.5 credit] (ELG 6179)

**Advanced Topics in Software Engineering**

Recent and advanced topics in the field of software engineering and related areas. Primary references are recent publications in the field. Prerequisite: permission of the Department.



SYSC 5800 [0.5 credit] (ELG 6180)

**Network Computing**

Design and Java implementation of distributed applications that use telecommunication networks as their computing platform. Basics of networking; Java networking facilities. Introduction to open distributed processing; CORBA, JavalDL, JavaRMI, CGI/HTTP, DCOM, Componentware; Enterprise JavaBeans, ActiveX. Agents: Java code mobility facilities. Security issues; Java security model.

SYSC 5801 [0.5 credit] (ELG 6181)

**Advanced Topics in Computer Communications**

Recent and advanced topics in computer-communication networks intended as a preparation for research. Students are expected to contribute to seminars or present lectures on selected topics. Prerequisites: SYSC 5201(ELG 6121) or ELG 5374 (EACJ 5607) or equivalent and permission of the Department.

SYSC 5802 [0.5 credit] (ELG 6182)

**Introduction to Information and System Science**

An introduction to the process of applying computers in problem solving. Emphasis on the design and analysis of efficient computer algorithms for large, complex problems. Applications in a number of areas are presented: data manipulation, databases, computer networks, queuing systems, optimization. (Also listed as MATH 5802, COMP 5802 and ISYS 5802.)

SYSC 5803 [0.5 credit] (ELG 6183)

**Logic Programming**

Review of relational databases, first order predicate calculus, semantics of first order models, deductive querying. Proof theory, unification and resolution strategies. Introduction to Prolog, and/or parallelism and Concurrent Prolog. Applications in knowledge representation and rule-based expert systems.

SYSC 5804 [0.5 credit] (ELG 6184)

**Advanced Topics in Communications Systems**

Recent and advanced topics in communications systems.

Prerequisite: permission of the Department.

SYSC 5806 [0.5 credit] (ELG 6186)

**Object Oriented Design of Real-Time and Distributed Systems**

Advanced course in software design dealing with design issues at a high level of abstraction. Design models: use case maps for high-level behaviour description; UML for traditional object-oriented concerns. Design patterns. Forward, reverse, and re-engineering. Substantial course project on applications chosen by students.

Prerequisite: permission of the Department.

SYSC 5807 [0.5 credit] (ELG 6187)

**Advanced Topics in Computer Systems**

Recent and advanced topics in computer systems. The course will generally focus on one or more of the following areas: specification, design, implementation, and modeling/analysis. Students may be expected to contribute to lectures or seminars on selected topics. Prerequisite: permission of the Department.

SYSC 5808 [0.5 credit] (ELG 6188)

**Communications Network Management**

Network management issues. WANs and LANs. The Internet and ISO models of network management. Network management protocols SNMP, CMIP, CMOT, etc. Events, Managed Objects and MIBs. Fault management techniques. Current diagnostic theory and its limitations. AI and Machine learning approaches. Monitoring and fault management tools. Prerequisite: SYSC 5201 (ELG 6121) or equivalent.

SYSC 5900 [0.5 credit]

**Systems Engineering Project**

Students pursuing the non-thesis M.Eng. program conduct an engineering study, analysis, and/or design project under the supervision of a faculty member.

SYSC 5901 [1.0 credit]

**Systems Engineering Project**

Project similar to SYSC 5900, but either of greater scope or longer duration.

SYSC 5905 [2.0 credits]

**M.C.S. Thesis**

Also listed as MATH 5905, COMP 5905

SYSC 5906 [0.5 credit] (ELG 6196)

**Directed Studies**

SYSC 5908 [1.5 credits]

**M.Sc. Thesis in Information and Systems Science**

Also listed as MATH 5908, ISYS 5908, COMP 5908.

SYSC 5909 [2.0 credits]

**M.A.Sc. Thesis**

SYSC 6909

**Ph.D. Thesis**



# Technology and Operations Management (TOMS)

## Sprott School of Business

TOMS 5301 [0.25 credit]

### Modeling Business Decisions

Quantitative methods for strategic, tactical, and operational business decision making. Optimization, simulation, project management, decision analysis, and multi-criteria analysis. Underlying ideas, model formulation, computer implementation, and analysis of model results, with applications from various business functions. Precludes additional credit for BUSI 5600 (no longer offered).

Prerequisite: BUSI 5801.

TOMS 5302 [0.25 credit]

### Operations Management

The provision of services and goods to customers, with focus on efficiency, effectiveness, and productivity. Planning and control of processes involving products, workers, equipment, suppliers, and customers. Effects of variation and uncertainty on lead time, inventory, quality, and customer service.

Precludes additional credit for BUSI 5600 (no longer offered).

Prerequisite: BUSI 5801.

TOMS 5303 [0.25 credit]

### Managing Projects

Foundations and core principles of managing projects and supporting techniques. Strategic, behavioral, team-based, technical, and global issues related to managing projects. Leadership dimensions, project selection and initiation, project definition, organization structure, risk assessment, scheduling, performance measurement, social responsibility, and learning systems.

Prerequisite: BUSI 5801 and enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

TOMS 5304 [0.25 credit]

### Logistics and Supply Chain Management

Foundations and core principles of logistics and supply chain management from domestic and global perspectives, with emphasis on organizational, strategic and operational issues. Context of logistics and supply chain, logistics and supply chain operations, SC designs.

Prerequisite: enrolment in the International Development Management Concentration of the MBA Program in the Sprott School of Business.

TOMS 5311 [0.25 credit]

### Quality Management

Defining quality, quality improvement, six sigma, lean enterprise, benchmarking and control charts; quality audits, ISO 9000, ISO 20000 and the progressive excellence program; role of quality assurance in service and product development; Process management and performance excellence. Precludes additional credit for BUSI 5401 (no longer offered).

TOMS 5312 [0.25 credit]

### Technology Development

Transformation of knowledge and ideas into products, processes and services. Development/innovation process models, successful and efficient integrated product/process/service development, cross functional teams, quality function deployment, lead-user approach, open innovations paradigm, disruptive innovations, and intellectual property management. Precludes additional credit for BUSI 5401 (no longer offered).

TOMS 5313 [0.25 credit]

### Technology Adoption for Services

Adoption and implementation of technology-driven products and processes for enhanced services. Technology forecasting and scanning; transfer of technologies including technology sourcing, pricing, transfer modes, and success factors; selection of appropriate technology, its vendor and consultant; risk management; managing change.

Precludes additional credit for BUSI 5700 (no longer offered).

TOMS 5314 [0.25 credit]

### Supply Chain Management

Organizational, strategic and operational aspects of managing supply chain from domestic and international perspectives. Outsourcing strategies, supplier relationship and information sharing, supplier networks, contracting and procurement management, logistic integration, role of information technology, and supply chain performance and metrics.

Precludes additional credit for BUSI 5601 (no longer offered).

## Technology Innovation Management (TTMG)

### Department of Systems and Computer Engineering

TTMG 5001 [0.5 credit]

#### Management Principles for Engineers

Develops a common level of knowledge among students on topics in project management, leadership, industrial marketing, managerial economics and organizational behaviour. These topics are relevant for engineers and computer scientists who manage the engineering processes that deliver innovative telecommunications systems, products and services.

TTMG 5002 [0.5 credit]

#### Telecommunications Technology

Fundamentals of telecommunications technology with emphasis on importance of bandwidth, communications reliability and networks. Topics include: information sources and coding of outputs; channel characteristics; signals; networks, signalling and switching; standards and regulation; major world systems and operators; and the thrust of new and future technology.

TTMG 5003 [0.5 credit]

#### Issues in Telecommunications

Discussion of key readings relevant to the telecommunications industry. Topics include the introduction of new products to the global market, technology sourcing, intellectual property rights, industry trends, technology and ethics, user interface design, new business opportunities and product identification, industry characteristics, regulation and international competition.

TTMG 5004 [0.5 credit]

#### Management of Design Systems

The focus is on how to design, maintain, expand and evolve organizations that deliver hardware, software and systems designs, and on the methods and tools used to improve their performance. Topics include: essence of design; how to set-up and lead fast-to-market organizations. Prerequisite: TTMG 5001 and TTMG 5002.

TTMG 5005 [0.5 credit]

#### Management of Telecommunications System Design

The focus is on the groups that evolve the architecture and technological infrastructures of firms and on product management. Topics include: relationship between architecture and product management; appropriability regimes; technology and complementary assets; managing projects that deliver products at different stages of their life cycles. Prerequisite: TTMG 5001 and TTMG 5002.

TTMG 5006 [0.5 credit]

#### Management of Software Engineering Projects

Models for the development of software. Software project management tools. Quality control. Risk assessment and management. Examples are drawn from software development in telecommunications applications. Prerequisite: TTMG 5001 and TTMG 5002.

TTMG 5008 [0.5 credit]

#### Corporate Communications Networks

Communications networks as a vital resource within organizations. Private networks as an infrastructure for information flow within a firm and across its interfaces. Applications and operations of corporate telecommunications networks. Networks as a source of competitive advantage. Implementation issues. Prerequisite: TTMG 5001 and TTMG 5002.

TTMG 5100 [0.5 credit]

#### Communications Standards

Importance of global standards in telecommunications and information technology for product development and business. Relevant public standards classified by type. The standards setting process. Formulation and execution of standards setting strategies. Integrating the firm's standards program with engineering processes, product management, systems groups and marketing. Prerequisite: TTMG 5001 and TTMG 5002.

TTMG 5101 [0.5 credit]

#### Integrated Product Development

The new product introduction process and time-based competition, basic concepts of integrated product development (concurrent engineering), the voice of the customer, quality function deployment, cross-functional teams, integrating information systems and technical tools, organizational support, manufacturing and design, cost estimation, implementation problems. Prerequisite: TTMG 5001 and TTMG 5002.

TTMG 5102 [0.5 credit]

#### Managing Full-Scale Production

Overall philosophy of just-in-time and time-based competition; just-in-time production and manufacturing resource planning; total quality management; socio-technical systems and employee participation; advanced manufacturing; manufacturing and facilities strategy, capacity planning; manufacturing flexibility; product/process evolution and the experience curve; service aspects of manufacturing. Prerequisite: TTMG 5001 and TTMG 5002.

TTMG 5103 [0.5 credit]

#### Advanced Topics in Telecommunications Technology Management

In-depth exploration of an advanced topic in the field of telecommunications technology management. A different topic is covered each semester and more than one section, with different topics, may be offered in the same semester. Prerequisite: One of TTMG 5004, TTMG 5005, TTMG 5101, or TTMG 5102.

TTMG 5104 [0.5 credit]

#### Directed Studies in Design and Manufacturing Management

The student explores, through extensive literature surveys, specific topics in the areas of design and manufacturing management. The objective is to acquire a suitable background to initiate and complete thesis work requiring this preparation. Precludes credit for any other directed studies in the program.

TTMG 5901 [1.0 credit]

#### M.Eng. Project

TTMG 5909 [2.0 credits]

#### M.Eng. Thesis

TTMG 5104 [0.5 credit]

#### Directed Studies in Design and Manufacturing Management

The student explores, through extensive literature surveys, specific topics in the areas of design and manufacturing management. The objective is to enable study on a specific topic to acquire a suitable background to initiate and complete thesis work. Precludes credit for any other directed studies.

TTMG 5901 [1.0 credit]

#### M.Eng. Project

TTMG 5909 [2.0 credits]

#### M.Eng. Thesis

## Women's and Gender Studies (WGST)

### Pauline Jewett Institute of Women's and Gender Studies

WGST 5000 [0.5 credit]

#### Issues for Feminist Scholarship

Selected issues based on the research expertise of the Instructor, designed to provide students with a broad introduction to the diversity of women's experiences within that issue. Critical issues related to race, class, gender and ability.

WGST 5001 [0.5 credit]

#### Research Seminar in Women's & Gender Studies

An examination of the Instructor's research focus (topics will vary from year-to-year) with respect to issues of feminist methodologies and epistemology related to developing and conducting feminist or women-centred research. The focus is interdisciplinary.

WGST 5901 [0.5 credit]

#### Advanced Topics in Women's and Gender Studies: Concepts of Gender

Cross-cultural perspectives on gender and its meanings, uses and implications. The applications of gender to different fields of knowledge, cultural expression, and institutional regulation. Gender will be interrogated as it intersects with race, class, ethnicity, age, and ability.

WGST 5902 [0.5 credit]

#### Advanced Topics in Women's and Gender Studies

Selected topics with a focus on issues from the humanities and social sciences. Topics may include: gender, power and social inequalities; women's writing; gender history; gender, sexuality and music embodiment; race, gender and imperialism; gender, criminology and criminal justice; queer theory; transnational feminisms.

WGST 5903 [2.0 credits]

#### MA Thesis

A substantial investigation of a topic in Women's and Gender Studies that will be determined in consultation with the Institute. Students will have a primary supervisor selected from within the Institute or from associated Faculty across the University. The candidate will be examined orally on the thesis.

WGST 5904 [1.0 credit]

#### Research Essay

An examination of an approved topic in an area of specialization of either the Institute faculty or associated faculty from across the University. Students will have a supervisor and a second reader.

WGST 5905 [1.0 credit]

#### Program Seminar

All MA candidates are required to take part in a seminar in which faculty members and students discuss new work in the field, analyze current issues in Women's and Gender Studies, and pursue topics of professional development. Students will prepare their thesis or research essay proposal in consultation with the course Instructor, faculty members and their peers.

WGST 5906 [0.5 credit]

#### Feminist Theory

An analysis of contemporary feminist theoretical debates that provides students with competence in the application of a range of theoretical models, and an appreciation of their specific historical contexts and development.

WGST 5907 [0.5 credit]

#### Researching Women's and Gender Issues

Consideration of a range of research methodologies and approaches relevant to women's and gender studies. In particular, students will examine the impact of gender studies on epistemological and methodological issues in a variety of academic disciplines.