

Engineering

Programs of study are offered by the Faculty of Engineering leading to the degrees of Master of Engineering and Doctor of Philosophy in Aerospace, Civil, Electrical, and Mechanical Engineering, to the degree of Master of Engineering in Materials Engineering and, in cooperation with the Faculty of Science, to the degree of Master of Science in Information and Systems Science.

The graduate programs in each of the engineering departments at Carleton University and the University of Ottawa are administered through joint institutes in three engineering disciplines. The Ottawa-Carleton Institute for Electrical Engineering was established in 1983; and for Mechanical and Aerospace Engineering, and for Civil Engineering in 1984. Each of these institutes combines the research strengths and resources of departments of engineering at Carleton University and at the University of Ottawa, and provides a framework for interaction. The institutes are also concerned with applications for graduate programs and graduate course offerings. Programs leading to master's and Ph.D. degrees are available through the institutes in a wide range of sub-disciplines in each department.

The areas of current research, the research facilities available, and the graduate courses offered, are given in the following pages for the four departments of the faculty:

- Civil and Environmental Engineering
- Electronics
- Mechanical and Aerospace Engineering
- Systems and Computer Engineering

Both the master's and Ph.D. programs may be undertaken on a full-time or part-time basis.

General information on awards and financial assistance is given in that section of this calendar.

A limited number of students who are not degree candidates may be admitted to each graduate engineering course. Credit earned as a special student normally cannot be credited towards a graduate degree in engineering.

Computing Facilities

Computing facilities available to engineering students include the university's central Honeywell mainframes with time-sharing terminals. In addition two VAX minicomputers, several SGI, SUN and Apollo workstations and many microcomputers reside in the engineering departments. Several other computers within the faculty are in use for data acquisition and specific research projects.

Special Arrangements

Research in an Outside Institution

A student may apply for permission to carry out his/her research, in part or whole, in an outside institution (for example, industrial, governmental, or university laboratory). Such an application, addressed to the Dean of the Faculty of Graduate Studies and Research through the Dean of Engineering, should:

- Include a detailed statement of the research proposal, of arrangements for supervision, and of the circumstances under which it is to be carried out
- Establish that the applicant will be able to pursue independent research
- State the facilities available for the research
- Include a proposed time schedule
- Be accompanied by a supporting letter from a responsible person in the outside institution giving approval of the proposal and accepting these regulations

Part-time Thesis Research

A part-time research program may be permitted if the conditions for the "presence" of the student (outlined under faculty regulations) are satisfied. It is the responsibility of the research supervisor to define the fraction of full-time research engaged upon by the student so that this can appropriately be credited to his/her program and assessed for payment of tuition fees. Before permission to undertake research on a part-time basis can be granted, the student must submit in writing, to the Dean of the Faculty of Graduate Studies and Research through the Dean of Engineering, a statement of his/her proposed manner of working part time, supported by a letter of approval from his/her employer.

Waiver of Thesis

A candidate for the master's degree who has, before admission, completed independent research or development projects of an adequate level of accomplishment, may apply to the chair of the department concerned for a waiver of the thesis requirement. Such application must be made at the time of initial registration, and must be supported by copies of published reports describing the work. If the application is approved, the candidate must complete ten half-courses or the equivalent, six of which must be graduate-level courses in engineering, to fulfil the requirement for the award of a degree

without a thesis. A candidate who has been granted a waiver of the thesis requirement will be required to take an oral examination on the subject of one of his/her published papers and topics related to his/her field of specialization.

Transfer of Credit

Normally credit for one full graduate course completed at another university may be accepted in partial fulfilment of degree requirements, provided that the course is appropriate to the candidate's program at Carleton University. Under special circumstances a second full course may be allowed. Refer to the general section of this calendar for details of the rules governing transfer of credit.

Transfer from Master's to Ph.D. Program

A student who shows outstanding academic performance and demonstrates high promise for advanced research during the full-time master's program at Carleton University may, subject to meeting the requirements below, and with the approval of the Admissions Committee of the Joint Institute administering his/her graduate program, be permitted to transfer into the Ph.D. program without receiving the master's degree. Such a student must complete the course requirements and thesis registration requirements of the master's program, but is exempted from submission of the thesis.

A student wishing to transfer should apply to the chair of his/her department. If the department and the Faculty of Graduate Studies and Research approve the application, the candidate will be required to take the comprehensive examination for the Ph.D. The requirements for the comprehensive examination will include the submission of a report on research to date, and a research proposal for the Ph.D.

After successfully passing the comprehensive examination, the student will be admitted to the Ph.D. program with normal program requirements (but with the comprehensive examination to his/her credit). If unsuccessful, he/she will remain in the master's program and be required to submit the thesis in the usual way.

Faculty Regulations

Graduate students in the Faculty of Engineering are governed by the section of this calendar entitled General Regulations, and by the regulations stated in this section.

All graduate students in the Faculty of Engineering must obtain satisfactory grades in their course work, must make satisfactory progress in their research if a thesis is included in their program, and must

satisfy the following criteria of activity or "presence" in the program:

- Maintain a close working relationship with their research supervisor
- Attend the courses for which they are registered
- Submit written reports and present seminars as required by their supervisor
- Attend departmental seminars held regularly to discuss current research and related topics. Each student is required from time to time to present a seminar on his/her research; part-time students who are not actively engaged in research are exempt from the seminar requirement
- Be readily available on an informal basis

Thesis Regulations

The thesis must represent the result of the candidate's independent research or development work, undertaken after admission to graduate studies at Carleton University. Experimental or theoretical results previously published by the candidate may be used only as introductory or background material for the thesis. A candidate may be permitted to carry on thesis research work off campus, provided that the work is approved in advance, and arrangements have been made for supervision of thesis research activities by a faculty member of Carleton University. A part-time student may use the Faculty of Engineering laboratory facilities for on-campus thesis research and development activities.

Each candidate submitting a thesis will be required to undertake an oral examination on the subject of the thesis and related fields.

Registration and Course Selection

- Undergraduate engineering courses may not normally be taken for credit
- All students require departmental approval for their program of studies, for course registration, and for any changes to their status or program
- Each full-time student is required, in any fall or winter program requirements of three or more half courses, to register for credit in at least three half courses. After the last day for withdrawal from courses in each such term, the student must remain registered in at least three half courses
- For part-time students, the department will arrange the appropriate course load and selection

Master of Engineering

Admission Requirements

Applicants are admitted under the general regulations specified in this calendar, but, in addition, are required to have strong undergraduate preparation in the appropriate engineering disciplines, computer programming, mathematics, and physics.

Program Requirements

Two alternatives are available for full-time students studying towards the degree of Master of Engineering, one involving a thesis plus course work, the other involving course work only. The choice of these alternatives must be arranged and approved at the time of admission into the program. Students are encouraged to take at least one half course outside of their department.

M.Eng. by Thesis

- A thesis based on the student's research
- A minimum of six half courses in engineering or a related discipline. The number of courses required by each department is specified in its section of this calendar

M.Eng. by Course Work

Specific program requirements are detailed in the departmental sections of this calendar.

Doctor of Philosophy

Admission Requirements

For admission to the Ph.D. program, an applicant must normally hold a master's degree in engineering (or its equivalent) and, by his/her previous program of study and scholastic record, demonstrate a capacity for advanced study and research. Experience gained while working in an engineering or research environment will be taken into account when assessing an application. The applicant must specify his/her intended field of research.

Program Requirements

The specific program requirements for the Ph.D. degree are the following:

- A minimum of two calendar years of full-time study (or the equivalent)
- Course requirements as established on admission, but not less than six half courses, or equivalent, in total (except in the Departments of Systems and Computer Engineering, Electronics, and of Mechanical and Aerospace Engineering); these requirements must include at least four graduate level half courses in engineering. Subject to approval of the student's adviser or advisory committee, the student may take, or be required to take courses in an appropriate discipline outside the Faculty of Engineering. (For information on admission and program requirements for the Departments of Systems and Computer Engineering, Electronics, and of Mechanical and Aerospace Engineering, please refer to pages 136 and 155 respectively)
- Substantial research
- A thesis on the research

Advisory Committee

An advisory committee with at least three members will be appointed by the department soon after a student's first registration. It has the responsibility of ensuring that conditions for the pursuit and completion of the student's program are fulfilled, and it reviews his/her program at least once a year.

Comprehensive Examination

The comprehensive examination is held approximately one year after initial registration in the program in the case of full-time students, and at an equivalent time in the case of part-time students. The purpose of the examination is threefold:

- To assess the student's comprehensive knowledge of his/her field of study
- To assess the preparedness and capability of the student for doctoral research
- To judge the suitability of the research topic for a doctoral thesis

The student is required to present his/her research proposal, and to be subjected to oral and written examination in appropriate fields of study. He/she will be informed by the advisory committee of the specific requirements of the examination. Having successfully completed the comprehensive examination, the student becomes a doctoral candidate.