

Regulations for the Computer Science Ph.D. Program*

Department of Computing and Software
McMaster University

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1 Introduction

This document contains the regulations for the Ph.D. program in Computer Science at McMaster University. It supplements, but does not supersede, the general regulations for Ph.D. programs at McMaster University given in the *School of Graduate Studies Calendar*. Please note that the regulations in this document apply to all students entering the McMaster University Computer Science Ph.D. program in Fall 2019.

Ph.D. students must successfully complete the equivalent of 4 one-term graduate courses, pass both Part I and Part II of the Comprehensive Examination, and successfully defend a Ph.D. thesis.

There are two tracks in the program, namely, the regular track and the accelerated direct-entry track with different admission criteria, course requirements and typical program length.

2 Admissions

2.1 New admissions to the regular track

Applicants may be admitted to the Ph.D. program in Computer Science if they have the equivalent of an M.Sc. in Computer Science with at least an average of B⁺ from a reputable institution.

Students with only a bachelor's degree should normally enrol as M.Sc. students in Computer Science with the exception of those meeting the requirements for the accelerated direct-entry track. After completing the first year of the Master's program, excellent students can be transferred to the Ph.D. program as regulated in the following subsection.

Outstanding students with at least a master's degree in Mathematics having reasonable Computer Science background may be admitted to the Ph.D. program in Computer Science. Each student's background will be assessed and a program of study designed to ensure appropriate depth and breadth in Computer Science. Depth and breadth of Computer Science knowledge will be tested in a two-part Comprehensive Examination. Exceptional students from other fields will be considered similarly on a case-by-case basis.

2.2 New admissions for the accelerated direct-entry track

Students with a Bachelor's degree in Computer Science, Software Engr. or closely related fields with good academic standing can be directly admitted to the full-time Ph.D. program. To be eligible,

1. English requirements for non-native speakers are TOEFEL ≥ 100 (out of 120) with writing score ≥ 25 (out of 30) or IELTS ≥ 7.5 with writing score ≥ 7.5 (out of 9)
2. Core course GPA ≥ 10 (out of 12) computed from:
 - a. 2 Calculus Courses, Linear Algebra, Discrete Mathematics, Data Structures & Algorithms

*Applicable to students admitted on or after Sept. 2019.

- b. The best of 7 out of 9 courses: Statistics/Probabilities, Operating Systems/Concurrent Systems, Software Design, Compiler, Computer Architecture, Databases, Programming Languages, Computer Networks, Theory of Computation
- c. Research experiences at undergraduate level are highly valued

2.3 Transfer from the Department's Master's programs

Advanced students in the Software Engineering M.Eng. or M.A.Sc. programs or in the Computer Science M.Sc. program may be admitted to the CS Ph.D. program without completing the Master's program if the candidate has:

- (i) completed the course requirements of the program with an average of at least A-,
- (ii) shown significant progress and maturity in research,
- (iii) the full support of the supervisor,
- (iv) the approval of the admission authority of the Ph.D. program,
- (v) the approval of the School of Graduate Studies

Requesting a Transfer:

- (i) A student wishing to transfer from a Masters program to the PhD program must prepare a transfer request that contains four sections:
 - (a) a status report including transcript of courses taken and grades earned,
 - (b) a description of the research or project carried out in the present program,
 - (c) an application for the new program,
 - (d) a statement by the supervisor indicating why he/she supports the transfer.
- (ii) The transfer request is considered by the same committee that processes other requests for admission to the Ph.D. program. If the committee approves the transfer, it sends the application to the School of Graduate Studies in the usual way.
- (iii) A transferring student must complete four courses beyond the Master's requirements, see Section 4.

3 The Supervisory Committee

As soon as possible, and in any case within the time limit specified in the Timeline section, a Supervisory Committee is appointed by the Department Chair or delegate.

1. The Supervisory Committee consists of at least three faculty members:
 - a. The Supervisor(s).
 - b. At least two additional faculty members, satisfying the following constraints:
 - i. At least one of the additional members must be from the Department.¹
 - ii. One of the additional members may be from another McMaster department.
 - iii. With permission of the Dean of Graduate Studies, one of the additional members may come from outside McMaster.
2. At least one Committee member must be a regular member of the Department.
3. The external member(s) are experts in the student's area of research.
4. Committee members are proposed by the Supervisor who is responsible for verifying their willingness and availability to serve.
5. The Committee is appointed by the Department Chair or delegate.
6. The Committee must meet at least once a year to monitor the student's grades and progress in research.
7. Additional duties of the Supervisory Committee are outlined in the McMaster Graduate Calendar.

¹Associate Members are considered to be *from the Department*.

4 Course requirements

Graduate courses in the Dept. of Computing and Software are grouped in three categories, i) Theory of computation and mathematics of computing (**Theory**), ii) Software and its engineering (**Software**), and iii) Computer systems and applications (**Systems**). Categorization of existing courses can be found in Appendix A.

All students must successfully complete at least 4 one-term graduate courses (beyond those taken for a Master's degree) Computer Science, Software Engineering or other relevant areas, such as Electrical and Computer Engineering or Mathematics. Among the four required courses,

1. At least two (2) Theory courses or two (2) Systems courses
2. At least one (1) course from a category differing from (i)
3. At most one (1) graduate course from outside the department subject to the approval of the student's supervisor and the graduate advisor
4. At most one (1) 600-level course
5. If requested by the Admission Authority (for candidates not fulfilling all the prescribed requirements for admission), or if the Supervisor identifies a deficiency, a student may be required to take additional courses, usually PUCs², to supplement their education.

In such cases the number of additional courses should normally be at most two, in some very exceptional cases at most four. A PUC may be replaced, when appropriate, by a PGC³.

6. The student, with the approval of the Supervisor, proposes the course selection for approval by the Department Chair or delegate.

4.1 Accelerated direct entry track

All students must successfully complete the equivalent of six one-term graduate courses in Software Engineering, Computer Science, or relevant areas such as Electrical and Computer Engineering or Mathematics. Among the six required courses,

1. At least two (2) Theory courses or two (2) Systems courses
2. At least one (1) course in Software
3. At least one course from a category differing from (a) and (b)
4. At most two (2) 600-level courses
5. Two free choices deemed relevant to the degree program and research, which can be from other departments subject to the approval of the supervisor and the graduate chair.

5 Milestones

Departmental seminar attendance Full-time students are required to attend minimum 4 times or 50% per academic year, whichever is lower during the first two years of the program.

Technical presentation Full-time students are expected to participate in the graduate poster & demo competition *once* in the first two years of the program. An exception to satisfying this requirement requires formal approval of the student's supervisory committee, and the Associate Chair of Graduate Studies.

Supervisory meeting Supervisory meetings must be scheduled once a year. Students should submit a supervisory report online at least 1-week before supervisory meetings (except during the years for thesis proposal and dissertation in lieu of supervisory meetings per SGS policies). Suggested content for the

²A PUC is a *Prescribed Undergraduate Course* that is required as part of a student's degree.

³A PGC is a *Prescribed Graduate Course* that is required as part of a student's degree. A PGC may be a prescribed course that either is included among or is additional to the normal number of required courses.

supervisory report can be found in Table 1 (assuming a typical duration of 4 years). Note this is a guideline and is not enforced.

Table 1: Suggested Content for Annual Supervisory Reports

| Year | Student Report | Supervisor and Committee Feedback |
|------|---|--|
| 1 | <ul style="list-style-type: none"> a. Statement of research topics b. Literature review (and gap analysis if applicable) | <ul style="list-style-type: none"> a. Progress in the program b. Comments on writing c. Technical suggestions |
| 2 | <ul style="list-style-type: none"> a. Problem statement b. Updated literature review and gap analysis c. Research methodologies/approaches d. Research plan and timeline e. Preliminary results if applicable | <ul style="list-style-type: none"> a. Progress in the program b. Comments on writing c. Technical suggestions |
| 3 | <ul style="list-style-type: none"> a. Progress summary b. Any revision/update to i) problem statement, ii) research methodologies/approaches, iii) research plan and timeline c. Reflection on what works and what does not and why? Plan to move forward | <ul style="list-style-type: none"> a. Progress in the program b. Comments on writing c. Technical suggestions |
| 4 | <p>A minimum of three weeks are expected between the student submitting his or her dissertation draft, receiving feedback from the committee and addressing any major concerns.</p> <p>Between Week 2 - 7 after the submission of dissertation drafts, students are to give a public seminar on their thesis.</p> | <ul style="list-style-type: none"> a. Progress in the program b. Comments on writing c. Technical suggestions |

6 Comprehensive Examination

6.1 Part I

The Comprehensive Examination consists of two parts. In Part I, Ph.D. candidates must demonstrate “graduate level” understanding of the undergraduate computer science material. There is a separate document describing the examination.

6.2 Part II: Thesis Proposal

This part of the Comprehensive Examination is based on the student’s thesis proposal. This examination is intended to ensure that the student understands both the theoretical and practical issues in the research area, and that he/she is well prepared to carry out the research described in the thesis proposal.

- a. Part II of the Comprehensive Examination is open to the public.

- b. The Supervisory Committee serves as the Examination Committee. The Computer Science Graduate Advisor chooses a member of the Supervisory Committee, who is not the supervisor, to be the Chair of the Examination Committee.
- c. The student submits his/her written thesis proposal, about 20–30 pages in length, to the Examination Committee four weeks prior to the date of the Examination.
- d. The thesis proposal should include a clear definition of the intended research problem(s), a careful survey of previous related work, discussion of the methodology to be used, and a timetable.
- e. The proposal should demonstrate that successful pursuance of the research will yield a substantial contribution to the body of knowledge of Computer Science.
- f. The student presents his/her research plan (at most 20 minutes) and gives answers, by means of oral presentation, to the Committee’s questions.
- g. The student defends his/her answers and justifies the choice of research topic.
- h. The Chair of the Examination Committee should allow time for questions from the public, up to a maximum of 15 minutes.
- i. The entire examination typically takes two hours.
- j. The Examination Committee will provide critical comments and/or suggestions.
- k. The Examination Committee recommends a result to the Computer Science Graduate Committee. The result of the Examination is normally *pass with distinction*, *pass*, or *fail*. In case of failure, the Examination Committee determines whether the student can continue, what actions are needed, and whether re-examination is necessary. The Computer Science Graduate Committee makes a recommendation to the Department based on the Examination Committee’s recommendation.

7 Ph.D. Thesis and Defense

The Ph.D. Thesis defense will be conducted by the School of Graduate Studies. The student and the Supervisory Committee are referred to the School of Graduate Studies regulations.

- a. The Ph.D. thesis in Computer Science must contain sufficient results for at least a refereed publication in a respected journal or prestigious conference proceedings.
- b. The external examiner should not be a member of the McMaster faculty and is encouraged to be present at the defense.
- c. It is the student’s responsibility to present a complete thesis in time.
- d. The Supervisory Committee must evaluate the thesis in the shortest possible time, but in any case within a three-month period, and request the necessary improvements.
- e. The Supervisory Committee certifies that the thesis is at an appropriate level and that it meets the standards of the thesis requirements.
- f. The final version of the thesis must be submitted to the Department’s Administrative Coordinator or delegate at least three weeks before the date of the defense. The thesis will then be made available to the faculty members of the Department.

8 Timeline

8.1 Full-Time Students

- a. The Supervisor is named when the student enters the program.
- b. Fully funded students having prestigious scholarships from government or international agencies (e.g., NSERC) might be admitted without having a supervisor at admission. In case no supervisor is named at admission, the Computer Science Graduate Advisor acts as nominal supervisor. The actual supervisor must be named not later than 6 months after the student’s arrival.⁴

⁴For new students, *arrival* means the date of first registration; for students transferring from a Master’s program, the date

- c. As soon as possible, and in any case not later than four months following the student’s arrival, the Supervisory Committee is appointed by the Department Chair or delegate.
- d. Students should normally take at least two one-term courses in each of the first two terms.
- e. The required four graduate courses should be successfully completed within 12 months after starting the program. When PUCs are required, the time window might stretch until 16 months.
- f. The Comprehensive Examination, both Part I and Part II, must be completed no later than 24 months after the arrival of the student.
- g. The thesis should normally be completed and defended within four years for the regular track and five years for the accelerated direct-entry track after the student enters the program; however, funding may continue beyond the duration at the Supervisor’s discretion.

8.2 Part-Time Students

- a. The Supervisor is named when the student enters the program.
- b. As soon as possible, and in any case not later than four months following the student’s arrival, the Supervisory Committee is appointed by the Department Chair or delegate.
- c. Students should normally take at least two one-term courses in each of the first two academic years.
- d. The required four graduate courses should be successfully completed within 24 months after starting the program. When PUCs are required, the time window might stretch until 28 months.
- e. The Comprehensive Examination, both Part I and Part II, must be completed no later than 36 months after the arrival of the student.
- f. Each of the two parts of Part I of the Comprehensive Examination should be taken for the first time no later than 20 months after the arrival of the student.
- g. The thesis should normally be completed and defended within six years after the student enters the program.

A Categorization of Graduate Courses

Graduate courses in the Dept. of Computing and Software are grouped in three categories, Theory of computation and mathematics of computing (**Theory**), Software and its engineering (**Software**), Computer systems and applications (**Systems**). The rationale of the categorization is to train well-rounded graduate students in Computer Science and Software Engineering with sufficient breadth in their knowledge. The categorization roughly follows the ACM Computing Classification System. Note that the following list is subject to changes due to removal and addition of courses.

| Category | Courses |
|----------|--|
| Theory | COMPSCI 6E03, COMPSCI 6O03, COMPSCI 6TC3, COMPSCI 6TE3, 701, 702, 705, 706, 708, 722, 734, 736, 739, 744, 746, 749, 751, 758, 760, 763, 774, 775 |
| Software | SFWRENG 6HC3, 703, 704, 707, 724, 725, 733, 738, 741a 743, 745, 756, 757, 761, 766 |
| Systems | SFWRENG 6WW3, COMPSCI 6F03, COMPSCI 6TB3, SFWRENG 6GA3, MECHTRON 6AX3, 720, 721, 726, 737, 747, 748, 750, 764, 765, 766, 767, 771, 772 |

of transfer.