McGill

Program/Concentration Revision Form

(2019)

1.0 Degree Title
Specify the two degrees for concurrent degree programs

M. Sc.

1.1 Major (Subject/Discipline) (30-char. max.)

Computer Science

1.2 Concentration (Option)
If applicable (30 char. max.)

Non-thesis

1.3 Category

- ☐ Faculty Program (FP)
- ☐ Major
- ☐ Joint Major
- ☐ Major Concentration (CON)
- ☐ Minor
- ☐ Minor Concentration (CON)
- ☐ Honours (HON)
- ☐ Joint Honours Component (HC)
- ☐ Internship/Co-op
- ☐ Thesis (T)
- ☐ Non-Thesis (N)
- ☐ Other

Please specify

1.4 Complete Program Title (info from boxes 1.0+1.1+1.2+1.3)

M. Sc. Computer Science (Non-thesis)

2.0 Administering Faculty or GPS

Graduate and Postdoctoral Studies (GPS)

Offering Faculty & Department

Faculty of Science / Computer Science

3.0 Effective Term of revision or retirement
Please give reasons in 5.0 "Rationale" in the case of retirement
(Ex. Sept. 2019 or 201909) ☐ Retirement

Term: September 2023

4.0 Existing Credits/CEUs: 45

Proposed Credits/CEUs: 45

5.0 Rationale for revised program – explain why revising

Starting September 2023 the School of Computer Science wants to allow students who are interested in advanced positions in industry to directly enter into the M.Sc. Non-Thesis program.
Currently, students perform a 15-credit project with an academic supervisor, additionally to taking a set of courses. We want to provide 2 alternatives, allowing to replace this project with either additional courses or with an 15-credit 4-month internship, typically taken during the summer.
The expected time to completion for this program is 16-months in case of a project or an internship (Fall, Winter, Summer, Fall) or 2 years in case of a course-based completion (Fall/Winter/Fall/Winter).

6.0 Revised Program Description (Maximum 150 words) – if revising, the existing must be included

7.0 List of existing program and proposed program

Existing program (list courses as follows: Subj Code/Crse Num, Title, Credit Weight, under the headings of: Required Courses, Complementary Courses, Elective Courses)	Proposed program (list courses as follows: Subj Code/Crse Num, Title, Credit Weight, under the headings of: Required Courses, Complementary Courses, Elective Courses)
Research Project (15 credits) 15 credits selected as follows: COMP 693 Research Project 1 (3 credits) COMP 694 Research Project 2 (6 credits) COMP 695 Research Project 3 (6 credits) Required Courses (2 credits) COMP 602 Computer Science Seminar 1 (1 credit) COMP 603 Computer Science Seminar 2 (1 credit) Complementary Courses (~~28 credits~~) ~~28 credits of COMP (or approved) courses at the 500, 600, or 700 level.~~ ~~Complementary courses must satisfy a Computer Science breadth requirement, with at least one course in two of the Theory, Systems, and Application areas. Areas covered by specific courses are determined by the Computer Science graduate program director.~~ ~~Category A: Theory~~ ~~COMP 523 Language-based Security (3 credits)~~ ~~COMP 525 Formal Verification (3 credits)~~ ~~COMP 527 Logic and Computation (3 credits)~~ ~~COMP 531 Advanced Theory of Computation (3 credits)~~ ~~COMP 540 Matrix Computations (4 credits)~~ ~~COMP 547 Cryptography and Data Security (4 credits)~~ ~~COMP 552 Combinatorial Optimization (4 credits)~~ ~~COMP 553 Algorithmic Game Theory (4 credits)~~ ~~COMP 554 Approximation Algorithms (4 credits)~~ ~~COMP 562 Theory of Machine Learning (4 credits)~~ ~~COMP 566 Discrete Optimization 1 (3 credits)~~ ~~COMP 567 Discrete Optimization 2 (3 credits)~~ ~~COMP 610 Information Structures 1 (4 credits)~~ ~~COMP 611 Mathematical Tools for Computer Science (4 credits)~~ ~~COMP 642 Numerical Estimation Methods (4 credits)~~ ~~COMP 647 Advanced Cryptography (4 credits)~~ ~~COMP 649 Quantum Cryptography (4 credits)~~ ~~COMP 690 Probabilistic Analysis of Algorithms (4 credits)~~ ~~COMP 760 Advanced Topics Theory 1 (4 credits)~~ ~~COMP 761 Advanced Topics Theory 2 (4 credits)~~	Required Courses (2 credits) COMP 602 Computer Science Seminar 1 (1 credit) COMP 603 Computer Science Seminar 2 (1 credit) Complementary Courses (43 credits) Students can complete either an internship or a research project, in addition to coursework. Students cannot do both. 0-15 credits: Research Project (15 credits) COMP 693 Research Project 1 (3 credits) COMP 694 Research Project 2 (6 credits) COMP 695 Research Project 3 (6 credits) Internship (15 credits) COMP 692 Internship Course (15 credits) Coursework (28-43 credits) Lecture- or seminar-based COMP courses at the 500 level or higher. The following courses outside of the School of Computer Science can count towards their complementary courses, subject to approval by an academic advisor. ECSE 507 Optimization and Optimal Control (3 credits) ECSE 508 Multi-Agent Systems (3 credits) ECSE 516 Nonlinear and Hybrid Control Systems (3 credits). ECSE 518 Telecommunication Network Analysis (3 credits ECSE 523 Speech Communications (3 credits) ECSE 526 Artificial Intelligence (3 credits) ECSE 539 Advanced Software Language Engineering (4 credits) ECSE 542 Human Computer Interaction (4 credits) ECSE 546 Advanced Image Synthesis (4 credits) ECSE 551 Machine Learning for Engineers (4 credits) ECSE 552 Deep Learning (4 credits) ECSE 556 Machine Learning in Network Biology (4 credits ECSE 570 Automatic Speech Recognition (3 credits) ECSE 626 Statistical Computer Vision (4 credits) MATH 523 Generalized Linear Models (4 credits) MATH 524 Nonparametric Statistics (4 credits) MATH 533 Regression and Analysis of Variance (4 credits) MATH 563 Honours Convex Optimization (4 credits) MATH 559 Bayesian Theory and Methods (4 credits) MATH 578 Numerical Analysis 1 (4 credits) MATH 680 Computation Intensive Statistics (4 credits) MECH 513 Control Systems (3 credits)

Attach extra page(s) as needed

8.0 Consultation with Related Units ☒ Yes ☐ No

Financial Consult ☒ Yes ☐ No

Attach list of consultations

9. Approvals

Routing Sequence	Name	Signature	Meeting Date
Department	Bettina Kemme Jin Guo		Sept 30th, 2022 Oct 3rd, 2022
Curric/Acad Committee	Melanie Xu on behalf of Academic Committee	Melanie XU	Oct. 25th. 2022
Faculty 1	Melanie Xu on behalf of Faculty	Melanie XU	Nov. 8th. 2022
Faculty 2			
Faculty 3			
CGPS			
SCTP			
APC			
Senate			

Submitted by

Name	Bettina Kemme
Phone	+1-514-398 8930
Email	bettina.kemme@mcgill.ca
Submission Date	Sept 15th, 2022

To be completed by ES:

CIP Code

REMINDER: Major revision proposals must be accompanied by a 2-3 page support document. See "Approval Paths" document on APC Web page to determine if your proposal is considered major: https://mcgill.ca/apc/.

(Continued box 7)

~~Category B: Systems~~

~~COMP 512 Distributed Systems (4 credits)~~
~~COMP 520 Compiler Design (4 credits)~~
~~COMP 529 Software Architecture (4 credits)~~
~~COMP 533 Model-Driven Software Development (3 credits)~~
~~COMP 535 Computer Networks 1 (4 credits)~~
~~COMP 614 Distributed Data Management (4 credits)~~
~~COMP 621 Program Analysis and Transformations (4 credits)~~
~~COMP 655 Distributed Simulation (4 credits)~~
~~COMP 667 Software Fault Tolerance (4 credits)~~
~~COMP 762 Advanced Topics Programming 1 (4 credits)~~
~~COMP 763 Advanced Topics Programming 2 (4 credits)~~
~~COMP 764 Advanced Topics Systems 1 (4 credits)~~
~~COMP 765 Advanced Topics Systems 2 (4 credits)~~

~~Category C: Applications~~

~~COMP 514 Applied Robotics (4 credits)~~
~~COMP 521 Modern Computer Games (4 credits)~~
~~COMP 546 Computational Perception (4 credits)~~
~~COMP 549 Brain-Inspired Artificial Intelligence (3 credits)~~
~~COMP 550 Natural Language Processing (3 credits)~~
~~COMP 551 Applied Machine Learning (4 credits)~~
~~COMP 555 Software Privacy (4 credits)~~
~~COMP 557 Fundamentals of Computer Graphics (4 credits)~~
~~COMP 558 Fundamentals of Computer Vision (4 credits)~~
~~COMP 559 Fundamentals of Computer Animation (4 credits)~~
~~COMP 561 Computational Biology Methods and Research (4 credits)~~
~~COMP 564 Advanced Computational Biology Methods and Research (3 credits)~~
~~COMP 565 Machine Learning in Genomics and Healthcare (4 credits)~~
~~COMP 579 Reinforcement Learning (4 credits)~~
~~COMP 585 Intelligent Software Systems (4 credits)~~
~~COMP 588 Probabilistic Graphical Models (4 credits)~~
~~COMP 618 Bioinformatics: Functional Genomics (3 credits)~~
~~COMP 652 Machine Learning (4 credits)~~
~~COMP 654 Graph Representation Learning (4 credits)~~
~~COMP 680 Mining Biological Sequences (4 credits)~~
~~COMP 766 Advanced Topics Applications 1 (4 credits)~~
~~COMP 767 Advanced Topics: Applications 2 (4 credits)~~

Master of Science (non-thesis) program.

Current Context:
Up until this semester, the School of Computer Science has not offered direct entry into the M.Sc. (non-thesis) program. Instead, by default, we only admitted students into the M.Sc. thesis program. Students can decide to transfer to the non-thesis program after entering the thesis program. However, the non-thesis program has so far been rarely used and serves as a way for students who are less well equipped for or less interested in research to complete their degree by taking more courses and doing an applied project rather than writing a thesis.

Rationale for direct entry into non-thesis M.Sc.:
The CS landscape in Canada and world-wide has changed dramatically over the last decade. Two things, in particular, lead to a further need in degrees at the M.Sc. level:
First, there are more and more jobs that need CS background at the graduate level and not only at the B.Sc. level. Deep knowledge in technology such as machine learning, AI, Big Data Systems and the need for experience with interdisciplinary topics, makes it necessary to extend the formation beyond the B.Sc. level. Thus, more advanced programs are needed.
Second, the market for IT and CS has become more global. This is one of the areas where more international students can boost the competitiveness of Canada. However, in order to better integrate international applicants into the Canadian market, a Canadian university degree is beneficial. The study at a Canadian institution will help the integration process and unify qualifications.
An additional interesting aspect is that the non-thesis program can be potentially open for a more diverse student body. In particular, women often switch into CS undergraduate programs later than man do, and might not have taken as many CS courses during their undergraduate studies. A non-thesis M.Sc. program allows them to extend their studies and take in-depth upper level courses.

A thesis-oriented M.Sc. is not necessarily the right path to achieve these goals as it does not offer the breadth component of a non-thesis M.Sc. and also not the opportunity for applied work during the studies. Furthermore, a non-thesis program will enable shorter finish times. Finally, non-thesis students will not require as many resources as thesis students. Supervising a thesis is time consuming and the School has only a limited number of tenure-track and tenured professors who would be able to offer such supervision. Thus, the number of thesis students the School can accept is heavily limited. For example, the School had to reject more than 90% of 1400 applicants for our MSc (thesis) program, including many qualified applicants. Anecdotally, perhaps half of those applicants would want to do a non-thesis Masters.

Rational for offering alternatives to the research project within M.Sc. (non-thesis) program
Offering both a course-based and an internship based alternative to the research project that non-thesis student currently conduct has several advantages.
First, it makes the program more attractive as student have more choice.

Second, also research projects need close supervision, of which the School has limited capacity. The two alternatives to the research project will require less resources from academic staff, although academic advising and oversight is still needed.
Third, industrial internships allow students to gain important practical experience and facilitate the recruitment process. Many universities already offer coop programs in computer science at the undergraduate level and these students are well sought of by industry. It makes only sense to offer such internships also at the advanced level.
Finally, the government of Quebec has recognized the importance of what they call a "professional" Master in Computer Science and provide funding for such programs. A M.Sc. (non-thesis) program could thus receive funding, if it offers practical experience.

By combining the strong graduate-level academic training the School offers to its graduate students with the practical experience of an industrial internship, our students will be in an excellent position to not only meet the demands of today's job market in computer science in the short-term, but will also have the depth of knowledge and professional skills needed to take leadership roles in the medium-term.

Overview of the new Internship course
This is a 15 credit course that will be typically taken during the summer (16 weeks). Over the course of their internship, a student will contribute to the company's/organization's mandate and apply their course-based knowledge in an industry setting within a well-defined project.

During the term preceding the internship, the student will research potential internships guided by their career interests, and submit their applications to selected companies/organizations. In this preparatory phase, an internship proposal will be developed. The actual internship lasts 16 weeks working on-site in collaboration with company/organization employees on the work packages defined in the internship proposal. A report must be completed at the end of the internship experience. The internship final report should provide a coherent account of the topic specified in the Internship Proposal, the work or research that was performed, and the role of the student in it. It should discuss what the student learned about the application of concepts, techniques, and ideas. This will also include reflections on their own experience in this regard, more general notes of interest to other professionals based upon their experience, and areas identified as needing further attention.

Each student will have an Academic Internship Advisor assigned during the winter semester. The advisor will be responsible for the educational integrity of the internship. The responsibilities for the Academic Internship Advisor will include curriculum planning, feedback, and evaluation.

APPENDIX 1

CONSULTATION REPORT FORM
RE PROGRAM PROPOSALS

DATE: Oct 4th, 2022

TO: Professor Ioannis Psaromiligkos, Department of Electrical and Computer Engineering

FROM: Dr. Jin Guo, School of Computer Science

The attached proposal has been submitted to the Curriculum Committee, and it has been decided that your department should be consulted.

Program Title: Master of Science (M.Sc.) Computer Science (Non-Thesis)

Would you be good enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal. Specifically, a course [or courses] taught by your department that has [have] been included in the program's list of courses.

X **NO OBJECTIONS** _____ **SOME OBJECTIONS**

COMMENTS:

Signature: J. Guo

Date: Oct 19, 2022

APPENDIX 1

CONSULTATION REPORT FORM
RE PROGRAM PROPOSALS

DATE: Oct 4th, 2022

TO: Dr Djivede A. Kelome, Department of Department of Mathematics and Statistic

FROM: Dr. Jin Guo, School of Computer Science

The attached proposal has been submitted to the Curriculum Committee, and it has been decided that your department should be consulted.

Program Title: Master of Science (M.Sc.) Computer Science (Non-Thesis)

Would you be good enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal. Specifically, a course [or courses] taught by your department that has [have] been included in the program's list of courses.

x **NO OBJECTIONS** _____ **SOME OBJECTIONS**

COMMENTS:

Signature: 

Date: October 17, 2022.

APPENDIX 1

CONSULTATION REPORT FORM
RE PROGRAM PROPOSALS

DATE: Oct 4th, 2022

TO: Professor Mathias Legrand, Department of Mechanical Engineering

FROM: Dr. Jin Guo, School of Computer Science

The attached proposal has been submitted to the Curriculum Committee, and it has been decided that your department should be consulted.

Program Title: Master of Science (M.Sc.) Computer Science (Non-Thesis)

Would you be good enough to review this proposal and let me know as soon as possible, on this form, whether or not your department has any objections to, or comments regarding, the proposal. Specifically, a course [or courses] taught by your department that has [have] been included in the program's list of courses.

X _____ **NO OBJECTIONS** _____ **SOME OBJECTIONS**

COMMENTS:

Signature: Rosaire Mongrain

Date: Oct 17, 2022