GRADUATE ACADEMIC CALENDAR AND COURSE CATALOGUE

2014 – 2015

UNIVERSITY OF ONTARIO
INSTITUTE OF TECHNOLOGY

uoit.ca/gradstudies

Vision

With its foundation in technology, the sciences and professional practice, the University of Ontario Institute of Technology (UOIT) advances the discovery and application of knowledge that accelerates economic growth, regional development and social innovation. It inspires graduates who will continue to make an impact on the world, as it is and as it will be.

Mission

- Provide superior undergraduate and graduate programs that are technology-enriched and responsive to the needs of students and the evolving workplace.
- Conduct research that creates knowledge, solves problems, results in economic and social innovation and engages students.
- Facilitate life-long learning that is flexible, inclusive and emphasizes opportunities for college-university transfers (Pathways).
- Develop academic and research collaborations with industry and community that stimulate and enhance the region and university at home and abroad.
- Cultivate a dynamic learning environment for students by promoting social engagement, fostering critical thinking and integrating experiences inside and outside the classroom.

Values

- **Integrity and respect** – We embrace honesty, inclusivity and equity in all that we do.
- **Honesty and accountability** – Our actions reflect our values, and we are accountable for both.
- **Dedication to quality and intellectual rigour** – We strive for excellence with energy, commitment and passion.
- **Pursuit of innovation** – We cultivate creativity, adaptability and flexibility in our students, faculty and staff.

Important Notice and Disclaimer

This calendar is intended to assist readers to understand the academic and administrative structure and policies and procedures of UOIT, and to describe the academic programs. By the act of registration each student becomes bound by the policies and regulations of UOIT, including the faculty in which the student is registered. Students are responsible for familiarizing themselves with the general information, rules and regulations contained in the calendar, and with the specific information, rules and regulations of the faculty or faculties in which they are registered or enrolled or seek registration or enrolment, as well as the specific requirements of each degree sought. It is each student's responsibility to ensure that the courses he/she chooses are consistent with program requirements.

The information contained in this calendar including, but not limited to, faculty and program information webpages and all courses set out in UOIT's course calendar is subject to change without notice. Nothing in UOIT's calendar is a representation, offer and/or warranty. Students are responsible for verifying UOIT admission, graduation, course, program, and fee requirements, as well as any requirements of outside institutions, industry associations, independent governing bodies, accreditation bodies or any other bodies that may award designations concurrently with, after completion of, or as a result of a UOIT program and/or course. Students are responsible for verifying the scope of practice that may be permitted by any outside institutions, industry associations, independent governing bodies, accreditation bodies or any other bodies that may award designations. UOIT makes no representation, offer and/or warranty about career opportunities and suggests only possible opportunities that may be available upon completion of a program and/or course of study.

UOIT reserves the right to make changes in the information contained in the calendar without prior notice. Not every course listed in the calendar will necessarily be offered in any academic year. UOIT reserves the right to limit the number of students who enrol in any program or course. While reasonable efforts will be made to offer courses as required within programs, admission to a program does not guarantee admission to any given course.

UOIT disclaims all responsibility and liability for loss or damage suffered or incurred by any student or other individual, person or group as a result of delays in or termination of its services, courses or classes by reason of force majeure, public health emergencies, pandemic, fire, flood, riots, war, strikes, lock-outs, damage to UOIT property, financial exigency or other events beyond the reasonable control of UOIT.

UOIT disclaims any and all liability to any student or any other individual, person or group for damages arising as a result of errors, interruptions or disruptions to operations

or connected with its operations or its campuses, arising out of computer failure or non-compliance of its computing systems.

If you require an alternate format of this publication, please contact the Office of Graduate Studies at 905.721.8668 ext. 6209 or **gradstudies@uoit.ca**.

Protection of privacy

UOIT respects your privacy. Personal information that you provide to UOIT is collected under the authority of the University of Ontario Institute of Technology Act (2002) (the UOIT Act). It is collected for the purpose of administering admission, registration, academic programs, university-related student activities (including, without limitation, athletic, recreational, residence, library and alumni programs), activities of student societies, financial assistance and awards, graduation and university advancement, and for the purpose of statistical reporting to government agencies.
University information on admission, registration and academic achievement may be disclosed to other post-secondary institutions for the purpose of administering admission and academic programs, as well as for statistical and research purposes.

The UOIT Act requires that UOIT and Durham College enter into agreements to share services. UOIT may disclose your personal information to Durham College employees who are providing services to UOIT. Such information will be shared only to the extent required to provide the service.

The university is required to report student-level, enrolment-related data to the Ministry of Training, Colleges and Universities as a condition of its receipt of operational grant funding. The Ministry collects this enrolment data, which includes limited personal information such as Ontario Education Numbers, student characteristics and educational outcomes, in order to administer government postsecondary funding, policies and programs, including planning, evaluation and monitoring activities. University information on admission, registration and academic achievement may also be disclosed to the provincial government for other statistical and research purposes.

Further information on the collection and use of student-level, enrolment-related data can be obtained from the Ministry of Training, Colleges and Universities website at **tcu.gov.on.ca** or by writing to the Director, Post-secondary Finance Branch, Post-secondary Education Division, 7th Floor, Mowat Block, 900 Bay Street, Toronto, ON M7A 1L2.

Personal information provided to UOIT and any other information placed into the student record will be collected, protected, used, disclosed and retained in compliance with Ontario's Freedom of Information and Protection of Privacy Act (R.S.O. 1990, c. F.31).

In addition to collecting personal information for its own purposes, the university collects specific and limited personal information on behalf of the Student Association (SA). The SA uses this information for the purpose of membership administration, elections, annual general meetings and its health plans. The university discloses personal information to the SA only for those purposes. Please direct any inquiries to the SA at 905.721.1609 or **sa@dc-uoit.ca**.

If you have any questions about the collection, use and disclosure of your personal information by the university, please contact the Chief Privacy Officer by sending an email to **accessandprivacy@uoit.ca**.

Notification of disclosure of personal information to Statistics Canada

Statistics Canada is the national statistical agency. As such, Statistics Canada carries out hundreds of surveys each year on a wide range of matters, including education.

It is essential to be able to follow students across time and institutions to understand, for example, the factors affecting enrolment demand at post-secondary institutions. The increased emphasis on accountability for public investment means that it is also important to understand outcomes. In order to conduct such studies, Statistics Canada asks all colleges and universities to provide data on students and graduates. Institutions collect and provide to Statistics Canada, student identification information (student's name, student ID number, Social Insurance Number), student contact information (address and telephone number), student demographic characteristics, enrolment information, previous education and labour force activity.

The federal Statistics Act provides the legal authority for Statistics Canada to obtain access to personal information held by educational institutions. The information may be used for statistical purposes only, and the confidentiality provisions of the Statistics Act prevent the information from being released in any way that would identify a student.

Students who do not wish to have their information used can ask Statistics Canada to remove their identifying information from the national database. On request by a student, Statistics Canada will delete an individual's contact information (name, address, or other personal identifiers) from the Post-secondary Student Information System (PSIS) database. To make such a request, please contact us:

Via telephone:
Monday to Friday – 8:30 a.m. to 4:30 p.m. EST/EDST
1.800.307.3382 or 1.613.951.7608

Via mail:
Institutional Surveys Section
Centre for Education Statistics
Statistics Canada, Main Building, SC 2100-K
Tunney's Pasture, Ottawa, Ontario, K1A 0T6

Via email:
PSIS-SIEP_contact@statcan.gc.ca

Further details on the use of this information can be obtained from the Statistics Canada website at **statcan.gc.ca**.

Glossary

Academic standing: A student's official status of enrolment at the university as evaluated at the end of each semester; used to assess whether students are meeting the standards prescribed for continuing in the university and/or their programs.

Academic year: The period from September 1 to August 31.

Appeal: The request for review of a judgment regarding the application of regulations.

Award: A general term used to mean any presentation, monetary or otherwise, made to a student.

Bursary: A monetary award given to a student where the primary criterion is financial need.

Corequisite: A course that must be taken concurrently with the course for which it is required.

Course: A unit of work in a particular subject normally extending through one semester or session, the completion of which carries credit toward the requirements of a degree.

Credit hour: The measure used to reflect the relative weight of a given course toward the fulfilment of degree requirements. Unless otherwise indicated, a course normally has a credit hour value of three.

Credit restriction: Where two or more courses are closely related, credit may be limited to one of the courses.

Cross-listed course: A course that is listed under two or more faculties and can be taken for credit from one faculty only.

Doctoral degree: An advanced degree in a specific area of disciplinary or interdisciplinary study that includes course work and a candidacy exam and normally completed after receiving a master's degree in a related subject area. Some doctoral programs may include a practicum or internship requirement. A doctoral degree requires intensive research and the creation and defense, before an examining committee, of a thesis that constitutes an original contribution to a field of study.

Field: An area of study within a graduate program related to its demonstrable and collective strengths. A field appears on the academic transcript, but does not appear on the degree parchment.

Final examination: Final examinations as referenced in the Graduate Academic Calendar and Course Catalogue should be interpreted in the ordinary sense of the word; usually covering all, or a very substantial portion of the material dealt within one academic term.

GPA: The abbreviation for grade point average. A semester GPA is the weighted average of the grade points awarded on the basis of academic performance during a single semester. A cumulative GPA is the weighted average of the grade points awarded in all courses completed by a student at the university.

Graduate diploma: A prescribed set of degree credit courses and/or other forms of study that can be undertaken as a stand-alone program or to complement a graduate degree program, and to provide specialization, sub-specialization or inter- or multi-disciplinary qualification. A graduate diploma is comprised of at least 12 credit hours of graduate-level study.

Graduate diplomas are classified as concurrent graduate diplomas (Type 2) and direct-entry (Type 3) graduate diplomas, consistent with the requirements as set out by the Council of Ontario Universities:

A concurrent graduate diploma is offered in conjunction with a specified master's or doctoral degree, the admission to which requires the candidate be already admitted to the master's or doctoral degree. It requires advanced-level, usually interdisciplinary, study, at least 50 per cent of which is in addition to the general requirements for the degree.

A direct-entry graduate diploma is a stand-alone, direct-entry program, developed by a unit already offering a related master's (and sometimes doctoral) degree, and designed to meet the needs of a particular clientele or market. UOIT Type 3 graduate diplomas may include non-degree credit courses to a maximum of 30 per cent of the total program credit hours.

Master's degree: An advanced degree normally completed after receiving a first degree in a related subject area. It contains a prescribed set of courses, and/or other units of study, research or practice within an area of disciplinary or interdisciplinary study, normally requiring at least 30 credit hours of study.

Master's degrees may comprise a thesis component, a project or major paper, or be primarily comprised of course work:

A master's degree with thesis is a research-oriented program comprised of advanced courses and intensive research culminating in a thesis. The thesis constitutes at least nine credit hours and involves an oral examination with assessment by an external examiner.

A master's degree with a project or major paper is a research-oriented program comprised of advanced courses and intensive research culminating in a project or major paper. The project or major paper constitutes at least six credit hours of supervised research and assessment by a research supervisor and a second reader.

A master's degree by course work is comprised primarily of course work, and may also include other units of study, research and practice.

Prerequisite: A course that must be successfully completed prior to commencing a second course for which it is required.

Program: A complete set and sequence of courses, combination of courses, and/or other units of study, research and practice, the successful completion of which qualifies the candidate for a formal credential, provided all other academic and financial requirements are met.

Registration: The process of selecting, enrolling in, and being assessed fees for courses.

Registration period: In a semester, the period extending from the first day of registration to the tenth lecture day, as stated in the academic schedule. In a session, it is the period extending from the first day of registration to the fifth lecture day.

Scholarship: A monetary award to a student based primarily on academic merit, although other criteria may be considered based on donors' requirements.

Semester: Sixty-four days of lectures and an examination period.

Session: A period of approximately seven consecutive weeks in the summer semester consisting of 32 days of lectures. The first half of summer semester is designated as spring session; the second half is designated as summer session.

Special student: A student who has applied and been accepted to take graduate-level courses without seeking a degree. Special students register formally in courses, with the consent of the instructor; such students submit assignments, write examinations, receive grades and may request an official transcript. Such students are charged full course fees.

Transcript: The complete report of a student's academic record.

Transfer credit: Academic credit granted for work completed at an institution other than UOIT.

Visiting student: A student admitted to another post-secondary institution, attending UOIT on a letter of permission.

Waiver: Permission granted by the appropriate authority for exemption from a particular program requirement and/or a particular university regulation.

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Section 1: Academic Schedule 2014-2015

Fall semester

September 1, 2014	Labour Day, no lectures.
September 2, 2014	Deadline for payment of fees, fall semester.
September 4, 2014	Lectures begin, fall semester.
	Last day to submit a program change request, fall semester.
	Last day to change full-time/part-time status, fall semester.
	Last day to submit a leave of absence form, fall semester.
September 17, 2014	End of regular registration period; last day to add courses, fall semester.
	Last day to drop courses in fee-per-credit graduate programs and receive a 100 per cent refund of tuition fees, fall semester.
	Last day to withdraw from a flat-fee graduate program and receive a 100 per cent refund of tuition fees, fall semester.
October 1, 2014	Last day to submit online application for graduation for students completing degree requirements at the end of the summer semester.
	Last day to withdraw from fall semester courses without academic consequences (i.e., without receiving a grade). Courses dropped after this date will be recorded on the academic transcript with a grade of W to indicate withdrawal.

October 1, 2014	Last day to drop courses in fee-per-credit graduate programs and receive a 50 per cent refund of tuition fees, fall semester.
	Last day to withdraw from a flat-fee graduate program and receive a 50 per cent refund of tuition fees, fall semester.
October 13, 2014	Thanksgiving Day, no lectures.
November 11, 2014	Last day to withdraw from fall semester courses. Active fall semester courses will be graded by instructors.
December 3, 2014	Last day of lectures, fall semester.
December 5 to 17, 2014	Fall semester final examination period. Students are advised not to make commitments during this period (i.e., vacation, travel plans).
December 15, 2014	Deadline for payment of fees, winter semester.
December 24, 2014 to January 4, 2015	University closed.
December 31, 2014	Last day to submit online application for graduation for students completing degree requirements at the end of the fall semester.

Winter semester

January 5, 2015	University reopens.
	Lectures begin, winter semester.
	Last day to submit a program change request, winter semester.
	Last day to change full-time/part-time status, winter semester.
	Last day to submit a leave of absence form, winter semester.

January 16, 2015	End of regular registration period; last day to add courses, winter semester.
	Last day to drop courses in fee-per-credit graduate programs and receive a 100 per cent refund of tuition fees, winter semester.
	Last day to withdraw from a flat-fee graduate program and receive a 100 per cent refund of tuition fees, winter semester.
January 30, 2015	Last day to withdraw from winter semester courses without academic consequences (i.e., without receiving a grade). Courses dropped after this date will be recorded on the academic transcript with a grade of W to indicate withdrawal.
	Last day to drop courses in fee-per-credit graduate programs and receive a 50 per cent refund of tuition fees, winter semester.
	Last day to withdraw from a flat-fee graduate program and receive a 50 per cent refund of tuition fees, winter semester
February 16, 2015	Family Day, no lectures.
February 16 to 20, 2015	Midterm break.
February 28, 2015	Last day to submit online application for graduation for the spring session of convocation for students completing degree requirements at the end of the winter semester.
March 18, 2015	Last day to withdraw from winter semester courses. Active winter semester courses will be graded by instructors.
April 3, 2015	Good Friday, no lectures.
April 10, 2015	Lectures end, winter semester.
April 13 to April 24, 2015	Winter semester final examination period. Students are advised not to make commitments during this period (i.e., vacation, travel plans).

Summer semester

May 1, 2015	Deadline for payment of fees, spring session and 14-week summer semester.
May 4, 2015	Lectures begin, summer semester (including 14-week summer semester and seven-week spring session).
	Last day to submit a program change request, summer semester.
	Last day to change full-time/part-time status, summer semester.
	Last day to submit a leave of absence form, summer semester.
May 8, 2015	Last day to add seven-week spring session courses.
	Last day to drop seven-week spring session courses in fee-per-credit programs and receive a 100 per cent refund of tuition fees.
May 15, 2015	Last day to add courses, 14-week summer semester.
	Last day to drop 14-week summer semester courses in fee-per-credit graduate programs and receive a 100 per cent refund of tuition fees.
	Last day to withdraw from a flat-fee graduate program and receive a 100 per cent refund of tuition fees, summer semester.
	Last day to withdraw from seven-week spring session courses without academic consequences (i.e., without receiving a grade). Courses dropped after this date will be recorded on the academic transcript with a grade of W to indicate withdrawal.
	Last day to withdraw from seven-week spring session courses in fee-per-credit graduate programs and receive a 50 per cent refund of tuition fees.

May 18, 2015	Victoria Day, no lectures.
June 1, 2015	Last day to withdraw from 14-week summer semester courses without academic consequences (i.e., without receiving a grade). Courses dropped after this date will be recorded on the academic transcript with a grade of W to indicate withdrawal.
	Last day to drop 14-week summer courses in fee-per-credit graduate programs and receive a 50 per cent refund of tuition fees.
	Last day to withdraw from a flat-fee graduate program and receive a 50 per cent refund of tuition fees, summer semester.
June 4 and 5, 2015	Convocation ceremonies. For more details, please refer to uoit.ca/convocation.
June 8, 2015	Last day to withdraw from seven-week spring session courses. Active seven-week spring session courses will be graded by instructors.
June 17, 2015	Lectures end, seven-week spring session.
June 18 to 21, 2015	Spring session final examination period. Students are advised not to make commitments during this period (i.e., vacation, travel plans).
June 22 to 26, 2015	Midterm break, 14-week summer semester.
June 25, 2015	Deadline for payment of fees (fee-per-credit programs only), seven-week summer session.
June 29, 2015	Lectures begin, seven-week summer session.
	Lectures resume, 14-week summer semester.
July 1, 2015	Canada Day, no lectures.

July 6, 2015	Last day to add courses, seven-week summer session.
	Last day to drop seven-week summer session courses in fee-per-credit graduate programs and receive a 100 per cent refund of tuition fees.
July 13, 2015	Last day to withdraw from seven-week summer session courses without academic consequences (i.e., without receiving a grade). Courses dropped after this date will be recorded on the academic transcript with a grade of W to indicate withdrawal.
	Last day to drop seven-week summer session courses in fee-per-credit graduate programs and receive a 50 per cent refund of tuition fees.
July 27, 2015	Last day to withdraw from 14-week summer semester courses. Active 14-week summer semester courses will be graded by instructors.
August 3, 2015	Civic Holiday, no lectures.
August 4, 2015	Last day to withdraw from seven-week summer session courses. Active seven-week summer session courses will be graded by instructors.
August 13, 2015	Lectures end, 14-week summer semester and seven-week summer session.
August 14 to 17, 2015	Summer semester final examination period (includes seven-week and 14-week courses). Students are advised not to make commitments during this period (i.e., vacation, travel plans).

Notes:

- Courses offered outside the normal teaching timeframe will have add/drop deadlines pro-rated accordingly. In such cases, faculties will advise students of appropriate deadline dates during the first meeting of the class.
- It is expected that students in a fee-per-credit program will register before the beginning of classes. If you register in a fee-per-credit course after the

tuition payment deadline, your tuition fees are due immediately and you may be assessed a late payment fee. Visit **gradstudies.uoit.ca/tuitionandfees** for a list of fee-per-credit programs.

- Deadlines related to the following can be found on the Graduate Studies website: application deadlines for admission to graduate programs at UOIT; deadlines for the submission of projects and major papers; submission and defense of theses/dissertations; tuition refund deadlines for thesis completion during a term; and deadlines for scholarships, awards and bursaries.
- Spring/summer session courses in Education may run on a schedule that varies from the above. Consult the Faculty of Education's website for specific start and end dates.

Section 2: Governing Bodies

2.1 Board of Governors

Chair
Glenna Raymond

Vice-Chairs
Adele Imrie
Ann Stapleford McGuire

Members
Michael Angemeer
Rupinder Brar
Garry Cubitt
Don Duval
Andrew Elrick
Miles Goacher
Donald Hathaway
Jay Lefton
Robert Marshall
John McKinley
Michael Newell
Lokendra Ramotar
Bonnie Schmidt
Larry Seeley
Andrea Slane
Pierre Tremblay
Heather White
Yowsif Yakub

Perrin Beatty, Chancellor (Ex-Officio)
Tim McTiernan, President and Vice-Chancellor (Ex-Officio)
Cheryl Foy, University Secretary and General Counsel, Secretary to the Board of Governors (Ex-Officio)

Note: The membership term for the Board of Governors commences in September. The list above reflects the 2013-2014 Board composition. The membership for the 2014-2015 academic year will be updated on the university website when available. More information on the members of the **Board of Governors** is available at **uoit.ca**.

2.2 University officers

Chancellor
Honourable Perrin Beatty, BA

President and Vice-Chancellor
Tim McTiernan, PhD

Provost and Vice-President, Academic
Deborah Saucier, PhD

Chief Financial Officer
Craig Elliott, CMA

University Secretary and General Counsel
Cheryl Foy, LLB

Vice-President, External Relations
Susan McGovern

Vice-President, Human Resources and Services
Murray Lapp, MBA

Vice-President, Research, Innovation and International
Michael Owen, PhD

Associate Provost, Academic and IT
Bill Muirhead, PhD

Associate Provost and Dean of Graduate Studies
Brian Campbell, PhD

Assistant Vice-President, Planning and Analysis, and Registrar
Brad MacIsaac, MBA

Assistant Vice-President, Student Life
Olivia Petrie, MEd

University Librarian
Pamela Drayson, PhD

2.3 Faculty deans

Dean, Faculty of Business and Information Technology
Pamela Ritchie, PhD

Dean, Faculty of Education
Suzanne de Castell, PhD

Dean, Faculty of Energy Systems and Nuclear Science
Brent Lewis, PhD, PEng

Dean, Faculty of Engineering and Applied Science
Tarlochan Sidhu, PhD, PEng, FIEEE, FEIC, FCAE

Dean, Faculty of Health Sciences
Ellen Vogel, PhD

Dean, Faculty of Science
Greg Crawford, PhD

Dean, Faculty of Social Science and Humanities
Nawal Ammar, PhD

Section 3: Policies and Procedures for Graduate Studies

3.1 Administration of Graduate Studies

3.1.1 Dean of Graduate Studies

The role of the Dean of Graduate Studies is central to all major academic and administrative graduate study activities.

3.1.1.1 Responsibilities

The responsibilities of the Dean of Graduate Studies include the following:

- Provide leadership, strategic planning and vision, particularly in the growth and development of graduate programs and activities.
- Administer all regulations relating to graduate studies.
- Chair the Graduate Studies Committee of Academic Council.
- Represent graduate studies at Academic Council.
- Represent the university's graduate studies to internal and external individuals and groups.

3.1.2 Graduate program directors

Each faculty and/or program has a graduate program director. This role is of critical importance to ensuring the success of the program and its students.

Graduate program directors should have a strong interest in students and their success, thoroughly understand UOIT's policies and procedures for graduate studies and be available on a regular basis to assist students seeking advice on issues related to their studies.

The graduate program director is accountable to the dean of the faculty and, with respect to graduate activities, to the Dean of Graduate Studies.

3.1.2.1 Appointment

The graduate program director is appointed by the dean of the home faculty, in consultation with the Dean of Graduate Studies. The duration of the appointment may be two or three years, at the discretion of the home faculty dean, with opportunity for reappointment.

3.1.2.2 Responsibilities

Each graduate program director has a formal role and responsibilities relating to the Graduate Studies Committee of Academic Council, including nominations, supervisory committees, student awards and similar matters.

The main duties of the graduate program director include the following:

- Ensure that all graduate studies policies and procedures are administered fairly and correctly and are communicated to students in their program.
- Chair the academic committee for the program and make recommendations to the Dean of Graduate Studies regarding the admission of applicants.
- Approve a program of study for each student and provide advice regarding changes to a student's status or program.
- Appoint a faculty advisor or research supervisor for each student.
- Where applicable, work with the student and research supervisor to form a supervisory committee and appoint a committee chair.
- Recommend external examiners to the Dean of Graduate Studies.
- Consider requests from students to defer an examination.
- Consider the approval of changes to a student's grade.
- Liaise regularly with the Dean of Graduate Studies and, as needed, with the Registrar.
- Maintain student records and forward to the appropriate UOIT office(s), as required.
- Provide advice, as needed, to units and bodies such as the Graduate Studies Committee of Academic Council.
- Help ensure that graduate students have the necessary resources, facilities and support.
- Co-ordinate financial assistance (including assistantships and fellowships) for graduate students.
- Help monitor the progress of graduate students.
- Provide input and assistance, as requested, for the creation and review of graduate programs.
- Mediate, as needed, in conflicts or disputes between a graduate student and his or her research supervisor.
- Co-ordinate graduate student recruitment activities for the program.

3.2 Graduate faculty appointments

Graduate faculty must have an academic appointment at UOIT.

All faculty members listed in the new proposal briefs are automatically considered for graduate faculty status as determined by the criteria set out below.

Graduate faculty status is effective until the program is subject to an external appraisal or internal audit. At this point, all faculty members are re-evaluated for graduate teaching and supervision privileges.

The updated graduate faculty list is published annually in the Graduate Calendar. It is the responsibility of the graduate program director to keep an up-to-date list of eligible faculty members who participate in a graduate program.

3.2.1 Categories of graduate teaching and supervision privileges

There are two categories of graduate teaching and supervision privileges: graduate faculty and associate graduate faculty.

Graduate faculty

Graduate faculty are UOIT core faculty members who are authorized to participate in a graduate program on a regular and sustained basis. These privileges are renewable for a program whenever it is appraised or audited. Graduate faculty are authorized to perform a variety of activities, including serving as a research supervisor or co-supervisor or as a member of a student's supervisory committee, participating in an examining committee, teaching graduate-level courses, acting as a faculty advisor, and mentoring and advising graduate students in all aspects of their program. Graduate faculty have a research program that includes externally refereed publication and experience that is appropriate for the graduate program. Being the sole supervisor of a PhD thesis student is restricted to graduate faculty who have advanced experience as appropriate for the graduate program.

Core faculty wishing to become graduate faculty are nominated by the graduate program director in consultation with the home dean(s) for the program and the core faculty member's home dean(s).

The nomination is forwarded to the Dean of Graduate Studies who can accept the appointment and report this to the Graduate Studies Committee or refer the case to the Graduate Studies Committee of Academic Council

for the decision. Core faculty who are denied graduate faculty status may appeal their case to the Graduate Studies Committee of Academic Council for a final decision.

Associate graduate faculty

Associate graduate faculty may be core, definite-term or continuing appointments. They may also be adjunct appointments or emeritus/emerita.

Associate graduate faculty may be appointed to serve on a supervisory committee. They may also be allowed to teach graduate courses and participate on an examining committee. Associate graduate faculty may be restricted in their privileges. For example, they may only have permission to teach graduate courses or to supervise on projects and not theses. Candidates for associate graduate faculty appointments are nominated by the graduate program director. Approval must be obtained from the program home dean(s) in consultation with the faculty member's home dean(s) with a memo to the Dean of Graduate Studies that includes an up-to-date curriculum vitae and any specified restrictions. Associate graduate faculty appointments do not exceed three years and are renewable. Core faculty who are denied associate graduate faculty status may appeal their case to the Graduate Studies Committee of Academic Council for a final decision.

In no case may associate graduate faculty serve as the sole thesis supervisor of a graduate student. Individuals with associate graduate teaching and supervision privileges may assist with the direction of a graduate student's research, following approval by the graduate program director, through appointment as a thesis co-supervisor. In this case, however, one of the co-supervisors must be a member of the graduate faculty for that graduate program.

3.3 Program

3.3.1 Program format

In some master's programs at UOIT, students may choose between one or more formats such as a thesis, project or a course work option. The program format and options are specified in the program descriptions in this academic calendar and in other program information.

Some master's programs require students to write a thesis, while other programs require a project, major paper or other work. The thesis, project or major paper is a central part of the student's program and helps fulfill one of UOIT's mandates: to promote the generation of knowledge through scholarly research of the highest quality.

A thesis is an original work that is overseen by a research supervisor and a supervisory committee. The thesis is worth at least nine credits and involves an oral examination that includes an assessment by an external examiner. A project or major paper for a master's degree is an original work that is supervised by a research supervisor and includes a second reader. Projects and major papers are worth at least six credits and do not require an oral examination or an external examiner.

A PhD student must prepare a written research proposal and pass an oral candidacy exam. Each PhD candidate's research and dissertation are overseen by a research supervisor and a supervisory committee. The dissertation must be defended before an examining committee. A PhD dissertation involves intensive research and constitutes a new contribution to the field of study.

3.3.2 New graduate programs and review of existing programs

When developing new graduate programs or reviewing existing ones, UOIT follows the Quality Assurance Framework of the Ontario Universities Council on Quality Assurance. Details on Quality Assurance at UOIT are available at **uoit.ca/footer/about/governance**.

3.4 Admission policies and regulations

3.4.1 Application procedure

Applications for admission to graduate studies programs are submitted online at **gradstudies.uoit.ca**.

Supporting documentation shall be submitted to the following address:

Office of Graduate Studies
University of Ontario Institute of Technology (UOIT)
Campus Corners, Suite 1400
2000 Simcoe Street North
Oshawa, Ontario L1H 7K4
Canada

3.4.1.1 Application deadline dates

Prospective students should refer to the Graduate Studies website for application deadlines. Applications submitted after published deadlines may be considered on an individual basis.

3.4.1.2 Assessment of eligibility

Stated grade requirements are normal minimum requirements. The actual cut-off levels for admission cannot be determined until applications are received. Preference is given to students presenting the strongest admission averages. Students whose grades have been affected by exceptional circumstances that can be documented are encouraged to write to the Office of Graduate Studies with appropriate information.

The Office of Graduate Studies at UOIT requires full disclosure of all marks achieved in all attempts at post-secondary courses.

Applicants seeking information on the applicability of their educational backgrounds may seek informal guidance from the Office of Graduate Studies, if their circumstances are straightforward. Applicants wanting a formal assessment of their credentials prior to application should contact a credential evaluation service. Official determination of admissibility and transfer of credit cannot be made until the point of application.

Regardless of educational background, all applicants to graduate programs must have specific prerequisite subject knowledge for their intended program of study. The prerequisite subjects for each program and other program-specific requirements are listed in the faculty sections of this calendar and on the Graduate Studies website. Normally, courses taken more than eight years prior to application will not be accepted. Individuals in this situation may apply as non-standard applicants. They may also be required to upgrade the prerequisite courses for their intended program of study. See Section 3.4.8 for more information on non-standard applicants.

3.4.1.3 Honesty in applications

Students must declare fully their educational history when applying to the university. Students must also advise the Office of Graduate Studies should they attend another post-secondary institution while registered as a student at UOIT. Failure to declare previous or concurrent post-secondary education, or the falsification of any documents related to such academic

pursuits, may result in suspension or expulsion from the university, including possible revocation of degrees awarded.

3.4.2 Admission requirements

Academic requirements

The academic requirements listed in this section have been established by the Office of Graduate Studies and are the minimum required for entry into a graduate program at UOIT. Some programs may have additional requirements, which could include higher GPA requirements than those listed. Applicants should refer to the Graduate Studies website for program-specific requirements. Please note that satisfaction of minimum entry conditions does not ensure admission.

Master's programs

Minimum academic requirements for UOIT master's programs:

- Hold a four-year honours degree or equivalent from a recognized institution in the area of graduate study or a closely related subject.
- Overall academic standing of at least a B average (GPA: 3.0 on a 4.3 scale), with a minimum B average in the last two full-time years (four semesters) of undergraduate work or equivalent.

Doctoral programs

Minimum academic requirements for UOIT doctoral programs:

- Completion of a research project or thesis-based master's level degree from a recognized institution in the same area of graduate study or a closely related subject.
- A minimum B+ average (GPA: 3.3 on a 4.3 scale).

Graduate diplomas

Minimum academic requirements for UOIT graduate diploma programs:

- Hold a four-year honours degree or its equivalent from a recognized institution in the area of graduate study or a closely related subject.
- A minimum B-minus average (GPA: 2.7 on a 4.3 scale).

Supporting document requirements

A number of supporting documents must be submitted to the Office of Graduate Studies to complete an application for admission. Some

programs may have additional requirements than those listed. Applicants should refer to the Graduate Studies website for program-specific requirements and for specific instructions related to the submission of documents.

Applicants must submit the following supporting documentation with their application:

- A minimum of two letters of recommendation from persons having direct knowledge of the applicant's academic competence.
- Proof of English proficiency if the first language is not English. See the policy on English language proficiency in Section 3.4.4.
- One official or certified copy (certified by the institution) of each previous undergraduate and graduate transcript.
- A one- to two-page statement of academic intent outlining the applicant's objectives in undertaking graduate study.
- A photocopy of the applicant's degree parchment(s).
- Any required program-specific documentation.

Applicants may also be asked to submit a brief description of the courses listed on the official transcripts or provide a copy of the relevant calendar in which they are listed.

3.4.2.1 Transfer from a thesis-based master's to a PhD program

This transfer option is for exceptional students who have demonstrated superior academic credentials and outstanding research potential in their master's degree program. Applicants are considered on a case-by-case basis and may not be considered at all in some programs. If a transfer from a master's degree to a PhD degree is allowed in a program, the following criteria must be met before a transfer from a master's to a PhD program can be considered:

1. Completion of a full master's program of course work with at least an A-minus average.
2. Significant progress in the student's master's research project.
3. Strong evidence of ability for advanced independent research.
4. Approval of the transfer by the research supervisor(s), supervisory committee, the graduate program director and the Dean of Graduate Studies.
5. Satisfactory completion of the PhD candidacy exam.

A judgment of satisfactory in the candidacy exam allows the student to transfer from a master's to a PhD. Upon transferring, the student must

fulfill all other requirements for the PhD. If the judgment is unsatisfactory, the student will continue in the master's program. There will be only one examination allowed for the transfer from a master's to a PhD.

3.4.2.2 Transfer from a PhD to a master's program

Graduate students may apply to transfer from PhD to master's programs. Transfers are only permitted if they are appropriate for the graduate student's personal and/or professional goals. PhD students who are not performing at a satisfactory level in their doctoral program normally will not be considered for transfer to a master's program.

3.4.3 Transfer credits

Credits from other universities within and outside Canada are evaluated on an individual basis. Credit is subject to the university's residency requirement (see Section 3.5.10) and to faculty-specific regulations.

All course credit transfers into graduate programs require the approval of the graduate program director of the faculty delivering the equivalent course. Graduate courses are not considered for transfer credit if they were completed more than eight years prior to admission or if the grade received in the course is below B-minus (70 per cent). Transfer credits are indicated by a T on the student's transcript and are not included in the calculation of the GPA at UOIT.

Students may request to have the outcome of an application for transfer credits re-evaluated on the basis of new information or additional clarification. The request should be directed to the Dean of Graduate Studies who will refer the case back to the appropriate admissions committee for a final decision. The request must be lodged in the academic term in which the application for transfer credit is made.

3.4.4 English language proficiency

All applicants are required to give evidence of their oral and written proficiency in English. This regulation outlines the standard ways that applicants must use to satisfy the English language proficiency requirement. If an individual program requires higher levels of proficiency or a difference in what is needed to demonstrate English language proficiency, this is listed in the individual program requirements.

The English language proficiency requirement may be satisfied with one of the following:

- Your mother tongue or first language is English.
- You have studied full-time for at least three years (or equivalent in part-time studies) in a university degree program where the language of instruction and examination was English or you have completed a university degree program where the language of instruction and examination was English. UOIT may ask you to provide official verification from your university that the language of instruction and examination was English. Please note: The minimum three-year requirement does not include full-time enrolment in English as a Second Language (ESL) programs.
- You have successfully completed all levels of an approved ESL program that has been designed for university preparation. Information on whether a particular program is approved as satisfying the English proficiency requirement can be obtained from the Office of Graduate Studies.
- You have achieved the required proficiency as listed below on one of the tests in English language acceptable to UOIT. Test results dated more than 24 months prior to the date of the application for admission to UOIT will not be considered. An official test score is required.

Please note: If you take an approved English language proficiency test, then its score shall prevail as the determining evidence of your English language proficiency.

The following table includes the minimum acceptable scores for English language proficiency tests at UOIT. If higher scores are required by a particular program, these are specified in the individual program requirements. It is also important to note that English language proficiency requirements may be higher for employment, including teaching assistant duties.

TOEFL (iBT)	83-87 (Minimum sub-scores: Listening 20, Reading 20, Speaking 19, Writing 20)
TOEFL (paper-based)	560
IELTS*	6.5
MELAB	85
CAEL	70 (with no sub-score below 60)

*UOIT Graduate Studies only accepts IELTS scores in the Academic testing format. Scores from the IELTS General Training format will not be accepted.

Applicants are advised to consult the Graduate Studies website for the most current requirements for their program.

Applicants must arrange for original test scores to be sent directly from the testing centre to the Office of Graduate Studies. UOIT's TOEFL Code is 7178. Applicants need to provide this code to TOEFL at the time of testing in order for test scores to be forwarded to UOIT.

Notwithstanding the above, individual applicants may be able to establish their spoken and written English language proficiency through some other combination of education, work experience or testing. Individual candidates who wish to establish their English language proficiency other than the ways outlined in this section should contact the Office of Graduate Studies. Despite the possibility of other options, please note that a test score from an approved English language proficiency test still prevails as the determining evidence of your English language proficiency.

The only exception to the English language proficiency admission requirement is if you are a Canadian citizen who has completed a degree at a Canadian university where the language of instruction is French.

UOIT reserves the right to test the English language proficiency of all students and to require further English language training.

3.4.5 Types of graduate students and offers of admission

Regular student: Applicants meeting the minimum admission requirements are considered for admission as a regular student. Regular student offers of admission are either firm offers with no conditions, conditional offers or offers with additional requirements.

Conditional admission: Conditional offers of admission may include, but are not limited to, requirements for submitting full official documentation, completing a previous degree or attaining a minimum score on an ESL test. Conditional offers of admission have time limits for the completion of conditions. The offer of admission will be rescinded if these conditions are not met.

Admission with additional requirements: Applicants who have some minor deficiency may be offered admission as a regular student with additional requirements. Offers of admission with additional requirements may include, but are not limited to, taking additional courses to make up for minor deficiencies or meeting other minor requirements or standards of performance. Offers of admission with additional requirements may have time limits. Meeting additional requirements are required for successful completion or continuation in a program.

Qualifying student: Applicants who do not meet the minimum admission requirements may be considered for admission to a qualifying term or terms. Applicants must be approved by the graduate program director who will prescribe a program of study to meet the admission requirements. During this time, the qualifying applicant will be admitted as a non-degree student until the qualifications outlined have been met and the qualifying student can be moved into regular student status. Courses taken and other work done during this qualifying period cannot be transferred for credit to the graduate degree or diploma.

All offers of admission for regular and qualifying graduate students are based on the recommendation of the graduate admissions committee for each program.

Special graduate student: Applicants who are non-degree or non-diploma seeking students may apply to take graduate-level courses for professional upgrading or personal interest. Applicants must apply through the Office of Graduate Studies and successful students must receive faculty consent prior to registering for the course. Normally, courses taken

as a special student cannot be transferred for credit to a graduate degree or diploma.

3.4.5.1 Classification of graduate students

Regular and qualifying students may be classified as full- or part-time.

Full-time status

Graduate students are considered full-time if they meet the following criteria:

- Pursue their studies as a full-time occupation.
- Formally identify themselves as full-time students on all documentation.
- Maintain regular contact with their faculty advisor or research supervisor, if applicable, and be geographically available and visit the campus regularly.
- If employed by UOIT, work no more than an average of 10 hours per week at diversionary employment while they are registered as a full-time student. Diversionary employment is work that takes a student's time away from his/her program of study and research. For example, teaching assistant positions are diversionary employment, while most graduate research assistantships are not if they directly support students in their programs of study and research. In calculating this diversionary work average, it is recognized that employment opportunities for full-time students may fluctuate throughout the year. Students have a diversionary work allocation of 510 hours in any 12-month period and no more than 255 hours in any of each of three terms: fall (September to December), winter (January to April) and spring/summer (May to August).

Part-time status

Graduate students who do not meet the above criteria are deemed part-time students. Part-time students may have course load restrictions. Students should consult the individual faculty with regard to the availability of part-time studies within their program.

3.4.5.2 Deferral of applications and offers

A request for a deferral of application or offer must be made in writing to the Office of Graduate Studies.

Deferral of applications

A deferral of application is normally made after an application has been received by the university and before an offer has been made. Applicants may defer their application for up to one year. Where an application is deferred, the applicant will not have to reapply but will be reassessed for admissibility on a competitive basis in the relevant admission period.

Deferral of offers

Applicants who are offered admission may apply to defer their offer of admission for up to one year. The deferral must be requested before the start of the term in which the student is scheduled to begin. The deferral of offer specifies the new start-time(s) for the offer; this cannot be more than one year. Deferrals of offer include a reassessment of scholarships, research assistantships, teaching assistantships and other funding commitments. An application for deferral of offer may be rejected. In such cases, an applicant will be given the option of a deferral of application for a specified start-time when it will be reassessed for admissibility on a competitive basis in the relevant admission pool.

3.4.5.3 Refusal of admission

Due to enrolment limitations and additional requirements in some programs, meeting the minimum requirements does not guarantee admission to the program. UOIT may, at its sole discretion, refuse admission to an applicant even if the minimum admission criteria have been met.

Applicants who do not meet the minimum admission requirements and who are refused admission may be advised by the graduate program director to complete a prescribed set of undergraduate courses to upgrade their credentials in the hope of a more favourable consideration of the student's application at a later date. Students who successfully complete the prescribed set of undergraduate courses are not guaranteed admission to a graduate program. They must resubmit an application to the program in question and this will be considered with all other applications submitted for that application period.

Courses taken and other work done to upgrade a student's credentials cannot be transferred for credit to a graduate degree or diploma.

Students completing this undergraduate work apply and register as special students as defined in UOIT's Undergraduate Academic Calendar and Course Catalogue.

3.4.6 Students with disabilities

The university welcomes supporting documentation from applicants with disabilities. Any documentation should be forwarded directly to the appropriate department by the application deadline. Applicants planning to study at either UOIT location should submit documentation to UOIT's Student Accessibility Services. The Office of Graduate Studies, in co-operation with Student Accessibility Services, ensures that each applicant is treated in a fair and equitable manner.

3.4.7 Program changes

Students wishing to pursue a program of study other than the one to which they were originally admitted must submit a change of program form to the Office of Graduate Studies. Such requests are subject to the admission requirements of the new program of study and final approval rests with the graduate admissions committee of the program. Changes are permitted only if space is available and all academic requirements are met. Students may be required to complete another application for admission. Program change requests must be submitted to the Office of Graduate Studies before September 1 for the fall term, January 1 for the winter term and May 1 for the spring/summer term.

3.4.8 Non-standard applicants

Non-standard applicant status allows individuals the opportunity to demonstrate academic potential by other than conventional academic means.

Four years after completion of a baccalaureate degree in a relevant discipline, applicants who do not meet the normal minimum admission requirements may apply as a non-standard applicant to a master's level program. Non-standard applicants with a degree must have a minimum of four years of relevant professional experience.

Applicants who have not earned a baccalaureate degree but who have other relevant academic credentials and normally 10 or more years of extensive and relevant workplace experience may also be considered as a non-standard applicant for a master's level program.

Non-standard applicants must submit references that specifically make a case that the applicant has an aptitude for research and graduate education.

Non-standard applicants normally cannot receive transfer credit for any courses. In addition to meeting all university and program-specific admission documentation requirements, non-standard applicants must provide a resumé, a one- or two-page statement of academic intent and a qualification portfolio.

The statement of intent should cover the following points:

- Reasons for wanting to pursue graduate studies.
- Future career goals.

The qualification portfolio should include the following components:

- An explanation of how activities that they have engaged in, including work or volunteer experience, professional development activities, personal study and interests, have prepared them for success in graduate studies at university.
- Explanations/documentation for any previous poor academic performance.
- Samples of writing within a professional context (e.g., company reports) that demonstrate their academic potential.

In addition, non-standard applicants without a degree must demonstrate how they have satisfied the equivalent of the bachelor's degree-level expectations that have been established by the Council of Ontario Universities. By doing this, non-standard applicants without a degree must show how they have the equivalent of a relevant degree at an appropriate level of performance. These degree-level expectations are available from the Office of Graduate Studies. Only a few programs will consider non-standard applicants without degrees, so please check with the Office of Graduate Studies as to whether this is an option for a particular program. Non-standard applicants without degrees may be admitted into a qualifying program as a transition into full admission.

The format guidelines for non-standard applicants are available from the Office of Graduate Studies.

Individual programs may request additional requirements and materials from non-standard applicants.

3.4.9 Visiting students

If certain conditions are met, UOIT students may apply to take courses at universities within and outside Canada and may request for credits earned to be transferred to their graduate program at UOIT.

Similarly, students from other universities within and outside Canada may apply to take courses at UOIT that can be applied to their graduate work at the institution at which they are registered.

3.4.9.1 Visiting students within Canada – Ontario Visiting Graduate Student Plan and Canadian University Graduate Transfer Agreement

The Ontario Visiting Graduate Student Plan (OVGSP) permits a graduate student to take courses at other Ontario universities while remaining a registered student at his or her home institution. UOIT students must complete the OVGSP form and provide an outline of the course they wish to take, desired term and the reason for requesting such permission. The course must be a requirement of the student's program and the request must be formally approved by the graduate program director, as well as the student's faculty advisor or research supervisor, before it can be submitted to the Office of Graduate Studies. Students from other universities wishing to register for graduate-level courses at UOIT should contact the graduate studies office at their home institution for more information regarding the process.

Similarly, UOIT students wishing to take courses at institutions outside Ontario but within Canada may do so through the Canadian University Graduate Transfer Agreement (CUGTA). This agreement provides students in good standing enrolled in a graduate degree or diploma program at a Canadian Association of Graduate Studies member university the opportunity to take courses offered at another member institution (host) for transfer credit to the program at their institution (home). The conditions for eligibility, documentation and process are similar to those of OVGSP. The CUGTA agreement requires students to pay tuition for the course(s) concerned and applicable incidental fees at the host institution.

The minimum mark a student must achieve to have the course transferred is B-minus (70 per cent). The grade from the transfer credit is not included in the calculation of the GPA at UOIT. Once the course is completed, students are responsible for having copies of the final transcript from the

host institution forwarded to the UOIT Office of Graduate Studies for award of transfer credit.

Details and forms for OVGSP and CUGTA are available from the Office of Graduate Studies or at **gradstudies.uoit.ca/formsandpublications**.

Only students who have been admitted without conditions or who have fully satisfied any conditions specified at the time of admission will be approved to apply for graduate courses at other universities through OVGSP, CUGTA or on a letter of permission (see Section 3.4.9.2).

3.4.9.2 Visiting students outside Canada – letters of permission

UOIT students wishing to take courses at universities outside Canada may do so on a letter of permission. Such an arrangement must be approved in advance by the student's graduate program director in consultation with the student's faculty advisor or research supervisor, as applicable. A letter of permission ensures that the courses to be taken at the host institution will be recognized for credit at UOIT and are applicable to the student's program of study. This allows the student to attend the host institution without formal admission. If the student is in clear academic standing and has the necessary prerequisite courses, the student shall complete a Letter of Permission Request form and submit the course outline(s) to the Office of Graduate Studies. Students are required to meet any application requirements specified by the host institution.

Once the course is completed, students are responsible for having copies of the final transcript from the host institution forwarded to the UOIT Office of Graduate Studies for award of transfer credit. The minimum mark a student must achieve to have the course transferred is B-minus (70 per cent). The grade from the transfer credit will not be included in the calculation of the GPA at UOIT.

UOIT students must apply for a letter of permission before taking a course elsewhere. Failure to do so could result in revocation of admission.

Students completing graduate programs at universities outside Canada can apply to complete individual courses at UOIT on a letter of permission from their home university. Such students shall be admitted to UOIT as non-degree students. Letter of permission students are required to submit a letter from the dean of graduate studies at their home university to the Office of Graduate Studies at UOIT. This letter should confirm that the student is registered in a graduate program at the home university,

approve the student's request to take the UOIT course and outline the expectations of work to be completed while at UOIT.

It is the responsibility of the students to ensure they have the necessary prerequisites and are academically prepared for the course. Students are responsible for any applicable application and letter of permission fees.

3.4.10 Readmission of former UOIT graduate students

Students previously admitted to UOIT, who have withdrawn from their program, are required to apply for readmission to the university.

Graduate students who have been dismissed from UOIT are not eligible to apply for readmission.

3.5 Registration policies and regulations

3.5.1 Session dates

Graduate students normally register for three academic semesters per year: fall (September to December), winter (January to April) and summer (May to August).

3.5.2 Degree requirements

All candidates pursuing a graduate degree or diploma shall enrol in an advanced course of study approved by the graduate program director of the program in which the student is registered.

3.5.3 Prerequisites/corequisites

Some courses have prerequisites or corequisites. Where a prerequisite is specified, the prerequisite must be taken prior to the course in question. Where a corequisite is specified, the corequisite must be taken at the same time or prior to the course in question. Prerequisites and corequisites may be waived with the permission of the graduate program director. Any student who requests such a waiver is responsible to ensure that he/she is adequately prepared to proceed with the level of study required in the course. Inadequate preparation is not a basis for appeal of a final grade in a course for which a student has requested a waiver of prerequisite or corequisite.

3.5.4 Full-time/part-time status

Students are required to register as full-time or part-time students at the time of admission and registration. With permission from the graduate program director, students may change their status from full-time to part-time, or vice versa, by completing a Change in Full-time or Part-time Status form and submitting it to the Office of Graduate Studies for approval by the Dean of Graduate Studies.

A change in status may have an impact on student aid and awards eligibility, fees, income tax credits and other areas.

For definitions of full-time and part-time students, see Section 3.4.5.1.

3.5.5 Selecting courses

Requirements for programs of study are listed in the faculty sections of this calendar. Students should become familiar with the degree requirements and plan their programs accordingly. Not all courses are offered in any one term or academic year. Elective offerings may vary from semester to semester. Students are advised to consult with their graduate program director, faculty advisor or research supervisor as part of the planning process. All courses in the student's program must be approved by the graduate program director.

Students cannot take courses for credit in addition to the course requirements for their graduate program.

3.5.6 Registration

Students must be registered in each term commencing with the term specified in their letter of offer and continuing until graduation.

Students are automatically registered in a graduate continuance course until graduation, withdrawal or program termination. Students must actively register for all other program courses. Students who do not formally register in a course cannot attend classes, access course materials on the learning management system, submit assignments for evaluation or be assigned a grade in that course.

3.5.6.1 Inactivity and reinstatement

If a student fails to maintain continuous registration in a program or to register after the expiry of an approved leave of absence, the student's status is changed to inactive for up to one year. Students who wish to re-

register within the one year period may apply for reinstatement. If reinstatement is approved, students are required to pay all fees owing as well as any reinstatement fees that are in effect at the time of reinstatement.

3.5.6.2 Inactivity and withdrawal

If the student fails to register for three consecutive terms, his/her file is closed and the student is withdrawn from the program. Should a student who has been withdrawn wish to continue their graduate studies, the student must apply for readmission. Readmission to the university and/or the student's original program is not guaranteed.

3.5.6.3 Concurrent registration

Graduate students may not be enrolled concurrently in two programs unless the programs are formally structured and approved for concurrent registration.

3.5.6.4 Auditing courses

Graduate students are permitted to audit courses provided they have the approval of their supervisor (if applicable), graduate program director and the course instructor. Students who are auditing courses cannot submit assignments for evaluation or receive a grade for the course.

3.5.6.5 Taking graduate courses outside the program

Graduate students may take graduate courses outside their program with permission from the student's supervisor (if applicable), graduate program director for the program and the graduate program director for the course. Students may be charged fees in addition to their regular program fee for such courses.

3.5.7 Course changes and voluntary withdrawal

Students may add courses with the approval of the graduate program director within the first two weeks of lectures in any given semester. Students may drop courses without academic penalty within the first 75 per cent of the semester. Withdrawal from courses within this time frame will be noted on the student's record with W. The W will not affect the GPA. However, a large number of W grades may affect the way a transcript is viewed by other post-secondary institutions or potential employers. Students should see the academic schedule for specific add and drop deadlines. Financial deadlines may differ from these dates.

Withdrawal from a course can have implications for the student's academic program. Students are advised to consider all course changes carefully. Students are reminded that non-attendance in a course is not equivalent to withdrawal.

Students who cease to attend a course, but do not formally withdraw, are academically and financially responsible for that course.

3.5.8 Program changes

Any changes to a graduate student's program must be approved by the graduate program director.

3.5.9 Second degrees

A student holding a UOIT graduate degree may pursue a second degree in another discipline as long as the admission requirements of the program to which the student is applying are met. Some credits earned to meet the requirements of the first degree may be applied to the second degree.

3.5.10 Residency requirements

At least half of a graduate student's courses must be from the UOIT course offerings in order to meet the residency requirements for graduation. Some master's programs may also have an on-campus residency requirement of up to 12 months. Some PhD programs may also have an on-campus residency requirement of up to 24 months. On-campus residency requirements, if any, are specified in the regulations for the particular program.

3.5.11 Time limits

Master's students

The minimum time allowed for full-time students to complete all requirements for a master's program is one year, and the maximum time is three years from the time of initial registration as a full-time student. Students registering on a part-time basis have a maximum of six years to complete the degree.

Doctoral students

The minimum time allowed for full-time students to complete all requirements for a doctoral program is two years, and the maximum time is six years from the time of initial registration as a full-time student.

Students registering on a part-time basis have a maximum of eight years to complete the degree.

Graduate diploma students

The minimum time allowed for full-time students to complete all requirements for a graduate diploma is one term, and the maximum time is one year from the time of initial registration as a full-time student. Students registering on a part-time basis have a maximum of three years to complete the graduate diploma.

Terms for which a student is granted a leave of absence shall not be included in these time limits.

3.5.11.1 Extensions

Students needing to exceed the normal allotted time for completion of their program must formally request an extension to their program. Extension requests are to be made after the normal program length to the Dean of Graduate Studies.

Students who do not complete degree requirements within the allotted time and have not been granted an extension will be withdrawn from the program. Under exceptional circumstances and on the recommendation of the graduate program director, a student who did not complete the degree requirements within the allotted time and has been withdrawn may be readmitted for one semester only to complete those requirements. Final approval for readmission must be granted by the Dean of Graduate Studies.

3.5.12 Absences from studies

Graduate students are expected to be uninterruptedly registered in their designated program of study in order to support the timely completion of their degree. However, the university recognizes that under certain circumstances students may need to absent themselves from regular study while maintaining their relationship with UOIT.

Such circumstances must have sufficient cause and an official leave of absence must be requested through the Office of Graduate Studies and approved by the Dean of Graduate Studies.

Acceptable circumstances include the following:

- Exceptional circumstances, including medical, extraordinary demands of employment and compassionate circumstances.
- Maternity leave, which is available to students during or following a pregnancy.
- Parental leave, which is available to students who face extraordinary demands in parental responsibilities or whose duties require that they be absent from their studies for a period of time.

A leave normally begins on the first day of term for a period of one, two or three academic terms.

During the period of leave, the following conditions apply:

- Students are not registered or required to pay fees.
- Students may not undertake any academic or research work, or use any of the university's facilities.
- Students are not eligible to receive UOIT scholarships or assistantships. In the case of other graduate student awards, the regulations of the particular granting agency apply.
- Except for parental leave or in exceptional circumstances, it is not expected that a student will be granted more than one leave under the terms of this policy. The time limits for completing the degree program will be extended by the duration of the leave taken (i.e., one, two or three terms, as appropriate).
- Leave of absence forms will not be processed for students who have outstanding fees.
- Students must inform the university immediately upon return.

3.5.13 Repeating courses

Students who fail one course are required to repeat the course or an approved alternative. If the failed course is designated as a mandatory course in the program, students must retake the same course. If the failed course is an elective course, students may be able to take an alternative elective course approved by the graduate program director. The approved alternative course or the second attempt of the failed course must be completed within 12 months of receiving the failing grade. Students who have a second failure are dismissed from the university.

All instances of a course appear on the academic transcript. The highest grade earned for the same course, or an approved alternative course, is used to calculate the student's GPA.

Students who fail one course are assigned probationary status and remain on probation until such time as they successfully complete the required course (within a maximum period of 12 months). They are required to maintain good standing (minimum B-minus grade) in all course work and satisfactory performance in all project/thesis work undertaken during this probationary period. The graduate program director or designate provides progress reports to the Office of Graduate Studies each term for the duration of the probation. Once the course in question has been completed successfully, the probationary status is removed. Students who fail two courses, whether in the same term or in different terms, and students who do not repeat their failed course, or approved alternative, within 12 months are dismissed from the university.

3.5.14 Examinations

3.5.14.1 Deferral of course examinations

Students whose religious obligations conflict with a scheduled final examination are permitted to write a deferred examination. Such students are required to give three weeks' notice to their graduate program director and to document the religious obligations involved.

Graduate program directors may grant deferred examinations on medical or compassionate grounds where sufficient documentation exists. A request for deferral on medical or compassionate grounds, along with supporting documentation, must be provided to the graduate program director within four days after the scheduled writing of the examination.

A graduate program director may also grant a deferred examination to a student who is scheduled to write three examinations in a 24-hour period. In this case, the exam in the middle of the three is normally the one that will be considered for deferral. Scheduling is conducted in such a way as to minimize the instance of consecutive examinations for students.

If a technical difficulty prevents the writing of a computer-based examination, the graduate program director may arrange for a deferred examination for all students in the class. Such an examination will be scheduled no later than the end of the first week of classes in the following semester.

3.5.14.2 Supplemental examinations

In some circumstances, students may be allowed to write one supplemental examination. The mark from a supplemental examination may replace or otherwise augment a mark previously obtained in an examination in the same course. Students should contact their graduate program director for regulations concerning supplemental examinations.

3.5.15 Grading, research progress and academic standing

3.5.15.1 Grading

Final grades for all courses are submitted to the Registrar's office on a letter grade scale. Credit is granted only for those courses completed with a grade of B-minus or better. Faculties may require higher grades in some courses to meet degree requirements. The grading scheme in Section 3.5.15.2 outlines the quality of work associated with each letter grade. Percentage-to-grade equivalencies are included as a guideline for conversion. A failing grade of WF may be assigned if a student is administratively withdrawn for non-attendance. Courses designated for pass/fail grading will be assigned a grade of PAS or FAL. For such courses, only failing grades are included in the calculation of the GPA. The grade of FAL has a weighting of 0.0 grade points.

Graduate continuance courses are assigned a grade of CO (continuance) and are not included in GPA calculations.

If a student's grade is not available when final grades are approved at the end of a term, special designation is temporarily added to his/her record. If a deferred examination has been granted, a grade of DEF is assigned. If a portion of the work required for the course is incomplete, a grade of INC may be recorded. These grades may satisfy prerequisites for further courses on a temporary basis, but not beyond the end of the subsequent term after which these grades revert to F.

3.5.15.2 Grading scheme

Grade	Percentage	Grade point	Description
A+	90-100	4.3	Very Good to Excellent. Student demonstrated mastery of the course material.
A	85-89	4.0	
A-	80-84	3.7	
B+	77-79	3.3	Acceptable to Good. Student demonstrated adequate knowledge of course material.
B	73-76	3.0	
B-	70-72	2.7	
F	0-69	0	Inadequate. Student did not perform to academic expectations.

For graduate students taking a standard undergraduate course or an undergraduate course that is offered at the graduate level, including a cross-listed graduate/undergraduate course or an undergraduate course with an additional graduate component, the minimum grade required for a pass is B-minus.

For undergraduate students taking a course at a graduate level, whether it is cross-listed or has additional graduate components, the student's work should be graded according to the existing undergraduate grading scheme.

3.5.15.3 Research progress

Student research progress is evaluated at the end of each semester for every student in programs with a thesis, project or major paper, starting when the student is engaged in their research.

The student's research supervisory committee is responsible for evaluating his/her research progress in relation to the student's overall research plan. Students may receive an evaluation of Satisfactory

Research Progress, Difficulties with Research Progress or Unsatisfactory Research Progress.

Satisfactory Research Progress means that the student is developing their research adequately relative to the stage in their research program. There may be minor problems with progress in an overall evaluation of satisfactory progress.

Difficulties with Research Progress indicates that a student has some important issue or issues that need to be addressed in order for the student to attain reasonable progress relative to the stage in the student's research program.

Unsatisfactory Research Progress indicates that a student has some fundamental problem or problems with their research progress relative to the stage in the student's research program.

Normally, students who are not progressing well will be given an evaluation of Difficulties with Research Progress as their first indication of serious lack of progress. Students with an evaluation of Difficulties with Research Progress must subsequently receive a satisfactory evaluation on their next research progress report in order to remain in clear standing.

Students with an evaluation of Difficulties with Research Progress who do not achieve a satisfactory evaluation on their next research progress report will receive an Unsatisfactory Research Progress evaluation. Clear and significant cases of lack of research progress may result in an Unsatisfactory Research Progress evaluation without first receiving an evaluation of Difficulties with Research Progress.

Students who receive an Unsatisfactory Research Progress evaluation will be assigned probationary status and remain on probation until such time as they successfully achieve a satisfactory evaluation on their research progress report. A student who receives a second Unsatisfactory Research Progress evaluation shall be dismissed. Student research progress reports are submitted to the Office of Graduate Studies to determine academic standing.

3.5.15.4 Academic standing

Academic standing is determined by the semester. The minimum cumulative GPA required for graduation is 2.7 and satisfactory completion of thesis, project or major paper, where applicable.

Clear standing	Students are required to maintain a minimum grade of B-minus (GPA: 2.7) in all graded components of the program as well as satisfactory research progress in programs with a thesis, project or major paper.
Probation	Students are placed on probation if they receive a failing grade in a course or if they receive an evaluation of unsatisfactory on a research progress report. Students placed on probation for failing a course will remove this reason for probation when they have successfully completed the failed course or an approved alternative course and their cumulative GPA is 2.7 or higher. Students on probation for unsatisfactory research progress remove this reason for probation when they receive a satisfactory evaluation on a research progress report.
Dismissal	Students will be dismissed for lack of academic progress. Lack of academic progress includes, but is not limited to: an evaluation of Not Acceptable in a thesis, project, major paper, or a second unsatisfactory evaluation in a PhD candidacy examination for students in a doctoral degree program; or any combination of two of the following: failed courses or unsatisfactory research progress reports.

Graduate students who have been dismissed from UOIT are not eligible to apply for readmission.

3.5.15.5 Grade changes

After grades have been officially approved and released, any grade changes must be submitted in writing to the Office of Graduate Studies. Grade changes may result from the submission of course work, the writing of a deferred examination, clerical errors or an approved examination reread. All grade changes must be approved by the course instructor and the graduate program director or designate.

3.5.16 Grade reappraisals and appeals

Matters concerning term work normally fall within the authority of the instructor. If a student has a concern regarding course work, the student should make an appointment as soon as possible to meet with the instructor so that any issues can be resolved quickly and informally. Students unable to comply with given deadlines must contact their instructor prior to the deadline if an extension to the deadline is requested. All term work must be submitted by the last day of classes, unless an earlier date has been specified. Instructors may grant extensions beyond their own deadlines or beyond the last day of classes up to the last day of the examination period provided that a student presents valid reasons of illness, etc., with appropriate documentation.

3.5.16.1 Requesting a grade reappraisal

In the event that a student wishes a grade on a piece of tangible work to be reappraised, he or she should, in the first instance, bring the disputed piece of work directly to the course instructor to seek informal resolution. If this course of action does not satisfy the student, he or she may seek a final grade appeal.

3.5.16.2 Grade appeals

Students may, with sufficient academic grounds, request that a final grade in a course be appealed. This will comprise only the review of specific pieces of tangible, but not oral, work. Grounds not related to academic merit are not relevant for grade appeals.

Students are normally expected to contact the course instructor first to discuss the grade received and to request that their tangible work be reviewed. Students should be aware that a request for a grade appeal may result in the original grade being raised, lowered or confirmed. The deadline for submitting grade appeals is three weeks after the release of final grade reports in any term.

If the student wishes to formally appeal the grade, the student shall lodge a request with the Office of Graduate Studies, who will contact the graduate program director and collect fees from the student for the appeal. Students must specify the rationale for their appeal by making clear the component of the final grade upon which they seek appeal. The graduate program director is responsible for ensuring that the work is reappraised by an appropriate faculty member, ensuring anonymity of both the student and the reappraiser, and communicating the result of the appeal (including

the reappraiser's comments) and the route of appeal to both the student and the course instructor. The reappraiser is given the nature of the assignment and the rationale for the original grade. It is expected that every effort will be made to render the decision within 30 days of the reappraiser's receipt of the work.

In the event that a student feels that the appeal procedures have not been followed appropriately, the student may submit, in writing, a formal request for a grade appeal to the Graduate Studies Committee. Such appeals can only be considered on the grounds of procedural irregularity.

Appeals must be submitted within 15 working days of notification of the decision. Appeals shall be heard by a panel of a minimum of three committee members, as determined by the Dean of Graduate Studies, including at least one student and at least two faculty members. The appeal hearing shall be chaired by the Dean of Graduate Studies or designate, who shall be counted as a panel member.

At the discretion of the relevant appeals panel, the student and/or the faculty member may be invited to meet with the panel to present their case(s) orally. The panel's decision is taken in camera and it is expected that parties will be informed of the decision in writing within 20 working days of the filing of the appeal.

3.5.17 Appeal of unsatisfactory research progress evaluation

Students may, with sufficient academic grounds, request that an unsatisfactory research progress evaluation be appealed. Students are normally expected to contact their research supervisor to discuss their evaluation and seek an informal resolution. If the concern is not resolved, he or she may request a research progress evaluation appeal. The student shall lodge the appeal with the supervisor's dean(s), specifying the rationale for the request and making clear the components to be re-evaluated. The deadline for appealing a research progress evaluation is the last day of the final examination period or three weeks after receiving the evaluation, whichever is later.

The appeal will be reviewed by a research progress appeal committee. This committee will be established by the supervisor's dean(s) and the program dean(s), should these be different. Should there be more than one dean involved, the deans will establish which dean(s) shall be responsible for managing the appeal. The research progress appeal committee will be comprised of the dean(s) delegate as chair and two

graduate faculty members. In reviewing the appeal, the committee shall meet with the student, who is entitled to be accompanied by a campus advisor at this meeting, provided 48 hours' notice is given as to the identity of the advisor. The committee may also meet with the research supervisor and the supervisory committee involved in the assessment. The committee will then conduct a thorough review of the matter and recommend a resolution to the dean. The dean will notify the student of the decision in writing. It is expected that every effort will be made to render the decision within 30 days of the committee having received the request.

In the event that a student feels that the procedures have not been followed appropriately, the student may submit, in writing, a formal request for an appeal to the Graduate Studies Committee. Such appeals can only be considered on the grounds of procedural irregularity. Appeals must be submitted within 15 working days of notification of the decision. Appeals shall be heard by a panel of a minimum of three committee members, as determined by the Dean of Graduate Studies, including at least one student and at least two faculty members. The appeal hearing shall be chaired by the Dean of Graduate Studies or designate, who shall be counted as a panel member. At the discretion of the relevant appeals panel, the student and/or the faculty member may be invited to meet with the panel to present their case(s) orally. The panel's decision is taken in camera, and it is expected that the parties will be informed of the decision in writing within 20 working days of the filing of the appeal.

3.5.18 Documents and student files

Documents submitted to the Registrar's office and the Office of Graduate Studies become the property of the university and are protected under provincial privacy legislation. Original copies of documents are kept on file at the Registrar's office and the Office of Graduate Studies and may not be returned to the student. Official student academic records deemed to have archival value and preserved in the university archives shall be made available to researchers authorized by the university for 75 years after the student ceases to be registered.

3.5.19 Conferral of degrees

Students expecting to graduate in any given term are required to contact the Registrar's office for application to graduate deadlines and information about the necessary forms and processes.

Degrees are deemed conferred at the time of Academic Council approval, and notation of the degrees awarded are entered on the students' records. All students who are awarded a degree are eligible to attend the session of convocation that immediately follows the date of conferral.

3.5.20 Provision for waiver of regulations

Waivers of course prerequisites/corequisites may be granted by the graduate program director. Waivers of faculty, degree or general regulations may be granted by the Dean of Graduate Studies.

3.5.21 Other academic policies

Students are advised to familiarize themselves with the following academic policies:

- Course evaluations.
- Responsibilities of academic staff with regard to students.
- Technology and web-centric teaching and learning.
- Use of Turnitin.com's plagiarism detection system.

Additional information on these policies is available at **uoit.ca**.

3.6 Student supervision

Each master's student has a faculty advisor or research supervisor to provide guidance throughout the program. In programs that do not require a thesis, project or major paper, the student is guided by a faculty advisor throughout the program.

A student registered in a program that requires a thesis, project or major paper may initially have a faculty advisor but will be assigned a research supervisor when the student begins his or her research. In some cases, a student may have co-supervisors, with the terms established through an agreement for co-supervision and made clear at the outset to all involved.

3.6.1 Faculty advisor appointment

The graduate program director is responsible for assigning faculty advisors.

3.6.2 Faculty advisor responsibilities

The faculty advisor is a member of the student's home faculty. The main responsibilities of the faculty advisor include the following:

- Consult with the student, recommend a program of study and submit it to the graduate program director for approval.
- Help the student choose an appropriate area of research, if applicable.
- Ensure that the student understands all degree requirements and regulations, as well as applicable policies.
- Be knowledgeable about, and inform the student of, key deadlines and related information.
- Be reasonably available to the student to discuss the program of study, as well as any academic concerns.
- If requested, advise the student on academic or personal student services or resources.
- Monitor the student's academic progress.

3.6.3 Research supervisor appointment

The relationship between the student and the research supervisor is most important to the student's successful completion of a graduate degree. The graduate program director will seek input from the student before assigning a research supervisor.

All research supervisory appointments must be approved in the first instance by the dean of the home faculty in which the student is registered. Except in extraordinary circumstances, approved on an individual basis by the Dean of Graduate Studies, research supervisors must be members of the UOIT core faculty. Associate graduate faculty, including adjunct professors, may serve as co-supervisors with the approval of the dean of the home faculty. Categories of graduate teaching and supervision privileges are defined in Section 3.2.1.

Before approving the appointment of a research supervisor, the dean should give careful consideration to the faculty member's research activities, supervisory experience and training, previous performance in graduate student supervision, the number of graduate students already being supervised, any imminence of leave (i.e., research, maternity or administrative) or retirement and any other relevant factors.

Since continuity of supervision is important in all graduate work, a change of research supervisor may be made only for strong reasons and after

extensive consultation with all involved. A request for a change may come from the student, the research supervisor, the graduate program director or the dean. It should normally be sent, in writing, to the graduate program director accompanied by the reasons for the proposed change. If the home faculty dean concurs with the request, the recommendation for change should be sent to the Dean of Graduate Studies for final approval.

3.6.4 Research supervisor responsibilities

Specific responsibilities of the research supervisor include the following:

- Be sufficiently familiar with the field of research to provide guidance and/or be willing to gain that familiarity before agreeing to act as a research supervisor.
- Be accessible to the student for consultation and discussion of the student's academic progress and research.
- Help the student select and plan a suitable, timely and manageable research topic.
- Co-operate with the student and graduate program director to establish a supervisory committee to convene meetings, normally at least once annually, to evaluate the student's progress.
- Respond in a timely, consistent and thorough manner to written work submitted by the student, with constructive and well-informed suggestions for improvement and continuation.
- Provide a research environment that is safe, healthy, tolerant and free from harassment, discrimination and conflict.
- Within the norms appropriate to the discipline, provide financial support and/or help the student obtain financial support from all reasonable sources.
- Endeavour to achieve consensus and resolve differences in the best interests of all involved when there is conflicting advice, or when there are different expectations on the part of co-supervisors or members of a student's supervisory committee.
- Appropriately acknowledge the contributions of the student in presentations and published material, in many cases via joint authorship.
- Be sensitive to cultural factors which may influence the individual student's learning and research behaviour and experience.
- Make arrangements for continuity of the student's supervision before beginning an extended leave of absence.

3.6.5 Student responsibilities

Students have the following responsibilities:

- Make a commitment and show substantial effort, initiative and dedication to gain the background knowledge and skills needed to pursue the research project successfully.
- Work with their research supervisor to develop a plan and a timetable for completion of all stages of the research project and work assiduously to adhere to a schedule and to meet appropriate deadlines.
- Meet regularly with their research supervisor and report fully and regularly on progress and results.
- Keep their graduate program director fully informed regarding any matter relevant to their status in the program and seek advice from their research supervisor, as appropriate.
- Meet agreed-upon performance standards and deadlines of funding organizations to the extent possible when financing has been provided by UOIT, funding agency or through a contract or grant.
- Adhere to the standards of research ethics, health and safety, and respect the requirements of academic integrity, honesty and professionalism. This includes, but is not limited to, acknowledging and crediting any source of ideas, assistance, materials and/or data provided by others.

3.6.6 Student-research supervisor conflicts

It is the responsibility of UOIT and its faculties to ensure that all graduate students receive appropriate and fair supervision. Due to the nature of the relationship between the student and research supervisor, conflicts may arise. In such instances, the first step must be to attempt to resolve the conflict informally between the student and research supervisor. It is the responsibility of the graduate program director to act as a mediator.

A student who believes the conflict has not been resolved should contact the dean of the student's home faculty. If the conflict persists, the student may pursue appropriate resolution through the Dean of Graduate Studies.

3.7 Supervisory committee

Each graduate student in a program that requires a thesis has a supervisory committee. Early formation of a supervisory committee, along

with regular meetings and formal meeting records, help ensure higher completion rates.

3.7.1 Appointment

The supervisory committee is appointed by the graduate program director after consultation with the research supervisor and the student. The appointment is made once the research supervisor is satisfied that the student has made adequate progress in the chosen research area.

3.7.2 Composition

Master's candidates

Normally, each supervisory committee for a master's level candidate consists of the candidate's research supervisor(s) and at least one other UOIT faculty member. The chair, who may be someone other than the candidate's research supervisor, is appointed by the graduate program director of the candidate's home faculty.

Doctoral candidates

The supervisory committee for a doctoral candidate consists of the candidate's research supervisor(s) and at least two other UOIT faculty members. The chair, who may be someone other than the candidate's research supervisor, is appointed by the graduate program director of the candidate's home faculty.

3.7.3 Responsibilities

The supervisory committee's main responsibilities include the following:

- Advise the student and help define the course of study.
- Assess and approve the student's research proposal.
- Provide support to the student and research supervisor by broadening and deepening the range of expertise and experience available.
- Be reasonably accessible to the student to discuss and suggest other sources of information.
- Offer comments when requested on written work submitted by the student.
- Review the student's progress toward successful completion of the thesis with scheduled meetings at least once per year.
- Provide constructive feedback and provocative discussion of the student's program of study, thereby exposing the student to a wider

range of expertise and ideas than can be provided by the research supervisor alone.
- Report progress to the graduate program director and recommend continuation in the program based on satisfactory performance (in the case of reports of unsatisfactory progress, the student may be required to withdraw from the graduate program).
- Recommend to the graduate program director and the Dean of Graduate Studies whether a thesis should move to oral examination. This recommendation must be made no less than three months prior to the date set for examination.

3.7.4 Chair's responsibilities

The main responsibilities of the chair of the supervisory committee include the following:

- Convene and run supervisory committee meetings.
- Keep the graduate program director informed of the student's progress.
- Recommend potential external examiners to the Dean of Graduate Studies.
- Forward a copy of the student's thesis to members of the examining committee at least four weeks before the oral examination.

3.8 Thesis, project or major paper

Many master's programs require students to write a thesis or major paper, or produce a project or portfolio. All written work must be in English and in correct, concise and scholarly language.

3.8.1 PhD candidacy examinations

Each student in a doctoral program is required to prepare a written research proposal and pass a candidacy exam. Full-time students are expected to do so within 18 months of their initial registration in the program. The examination is to determine whether the candidate has the appropriate knowledge and expertise to undertake a thesis in the selected field of study.

A candidacy committee conducts the examination. This committee consists of the following members:

- The student's supervisor(s).
- At least two additional members from the student's supervisory committee (the student's supervisory committee must be established prior to the oral examination).
- Graduate program director (or delegate) as chair. The chair cannot be a member of the student's supervisory committee.
- An external examiner from outside the program who is not involved with the student's course of study. This external examiner is appointed by the Dean of Graduate Studies in consultation with the graduate program director.

All members of the committee are voting members. In the case of co-supervision, co-supervisors collectively have one vote.

The candidacy committee must be established at least four weeks prior to the exam. The candidacy examination comprises the following:

1. A written thesis proposal which must be distributed to the candidacy committee at least four full weeks prior to the examination date. The thesis proposal demonstrates:
    i. The student's mastery of the relevant background knowledge, including an appropriate breadth of knowledge in the discipline.
    ii. A coherent and achievable research plan that will result in an original contribution.
2. An oral presentation of the PhD thesis proposal (preferably 20 minutes and not to exceed 30 minutes), followed by open questioning of the candidate by the candidacy committee to ascertain the readiness of the candidate to carry out the proposed research.

At the end of the oral exam, the chair asks the candidate to leave and the candidacy committee meets in closed session. The candidacy committee deliberates and makes a judgment of satisfactory or unsatisfactory. A written report is prepared by the chair, signed by all committee members and submitted to the Office of Graduate Studies with copies to the members of the candidacy committee. The results are communicated to the student by the chair of the committee.

3.8.1.1 Outcomes of PhD candidacy examination

A judgment of satisfactory allows the student to proceed with PhD studies.

If the judgment is unsatisfactory, the student is required to retake the exam within four months. For a second exam, the examination team must include an additional member of the graduate faculty who was not involved in the original examination.

A judgment of satisfactory in a second exam allows the student to proceed with his/her studies. If a student receives an unsatisfactory judgment in a second attempt at a candidacy exam, or if a student does not retake the candidacy exam within four months after an unsatisfactory first attempt, the student shall receive a grade of Fail and be dismissed from the PhD program.

For those students taking the candidacy exam to transfer from a master's to a PhD, a judgment of satisfactory allows the student to transfer. For further details, see Section 3.4.2.1.

3.8.2 Permission to begin

Permission to begin the thesis is given by the student's supervisory committee when there is general agreement that sufficient research has been done. If the student's program requires a project or major paper, the student's research supervisor authorizes the student to begin the project or major paper.

Students should seek guidance from their research supervisor regarding the use of a style manual appropriate to the academic discipline in which they are working, as well as other available guides to assist in effective writing. See **gradstudies.uoit.ca/thesis** for deadlines, guidelines and procedures for thesis preparation and submission.

Students are also expected to be aware of and observe copyright requirements and to follow standards as outlined in UOIT's policies on Research Ethics and Research Involving Animals. Further details are available at **research.uoit.ca**.

3.8.3 Use of copyright material in student work

When preparing a thesis, major paper or other program work, students may include some copyright material, typically in the form of excerpts from books or articles, charts, diagrams or similar previously published materials. It is the student's responsibility to acknowledge properly any copyright materials used, strictly following the citation guidelines and rules of the faculty and/or program.

As well, students who use extensive selections of copyright work may need to seek advance written permission from the author and must append the letter to their work. Students should contact the copyright holder well in advance of their deadline as obtaining permission to use copyright materials may take considerable time. In addition, students may be required to pay a fee to obtain such permission. Questions regarding the use of copyright materials should be discussed with the faculty advisor or research supervisor, as appropriate.

Students may be required to submit their work to Turnitin.com. Further information can be obtained online from UOIT's policy on the Use of Turnitin.com's Plagiarism Detection System at **uoit.ca**.

3.8.4 Oral examination for master's and doctoral candidates

Master's candidates whose programs require a thesis and doctoral candidates are required to defend their completed thesis/dissertation orally in front of an examining committee. Candidates are expected to follow the advice of their research supervisor(s) and their supervisory committee in establishing when their work is ready for examination. In exceptional circumstances, candidates may request that the Dean of Graduate Studies arrange for an examination of the thesis/dissertation or other work without the support of the research supervisor(s) and supervisory committee.

It is the candidate's responsibility to ensure that all materials are prepared and assembled appropriately. Candidates should consult their research supervisor(s) for specific regulations on the preparation and presentation of thesis/dissertation materials.

3.8.4.1 Examining committee

The examining committee evaluates the academic merit of each student who defends a thesis and decides whether the candidate has satisfactorily passed the oral examination.

Master's candidates

For master's candidates, the examining committee consists of all members of the supervisory committee plus one external examiner (see Section 3.8.4.2). The committee is chaired by the graduate program director or designate.

Doctoral candidates

For doctoral candidates, the examining committee consists of the external examiner, one university examiner (see Section 3.8.4.2) and all members of the candidate's supervisory committee (including the research supervisor(s)). The committee is chaired by the graduate program director or designate.

3.8.4.2 External and university examiners

Master's candidates

An external examiner is typically a faculty member outside the student's program. The external examiner for a master's oral exam cannot be an associate or adjunct member of the student's home faculty, nor had any direct or indirect contact with the candidate as either a course instructor or supervisor of the candidate's thesis. This person will have considerable direct knowledge in the field of study of the subject matter.

The external examiner is appointed by the Dean of Graduate Studies upon recommendation of the graduate program director. When an external examiner from outside the university is recommended, a curriculum vitae and written rationale for the choice must be provided to the Dean of Graduate Studies.

Conflicts of interest must be avoided when recommending the names of external examiners to the Dean of Graduate Studies. External examiners must not be teaching or supervising family members or relatives of the candidate, must not be closely linked in a personal or research capacity, nor shall they have shared financial interests with either the candidate or the research supervisor(s). Should the candidate's thesis contain chapters or sections of previously published works, the external examiner shall not have been involved in the review or editing of this material in any capacity.

Doctoral candidates

The university examiner is a core faculty member at UOIT who has not been involved with the candidate in any teaching or supervisory capacity.

External examiners should hold the rank of full or associate professor (or equivalent) if they are at a university, or of comparable expertise and standing if not at a university. An external examiner for a PhD dissertation is a well-qualified, objective and experienced individual who has not had any direct contact with the candidate as either a course instructor or supervisor of the candidate's dissertation and who is not associated or

affiliated with UOIT. This person shall have considerable direct knowledge in the field of study of the subject matter.

The university and external examiners are appointed by the Dean of Graduate Studies upon recommendation of the graduate program director. A curriculum vitae of the recommended external examiner and written rationale for the choice must be provided to the Dean of Graduate Studies.

Conflicts of interest must be avoided when recommending the names of university or external examiners to the Dean of Graduate Studies. University and external examiners must not be teaching or supervising family members or relatives of the candidate, must not be closely linked in a personal or research capacity, nor shall they have shared financial interests with either the candidate or the research supervisor. Should the candidate's dissertation contain chapters or sections of previously published works, the university and external examiners shall not have been involved in the review or editing of this material in any capacity.

3.8.4.3.1 External examiner's report for master's and doctoral candidates

The external examiner shall prepare a report of his/her assessment of the candidate's thesis and send it to the Dean of Graduate Studies or designate no less than one week before the scheduled exam date. The Dean of Graduate Studies may postpone the final examination if the external examiner's report is not received by this deadline.

The dean or designate will distribute copies of the report to all other members of the examining committee. The content of the report is confidential and must not be discussed with the candidate prior to the final examination. Depending on the content of the report, the examining committee and the Dean of Graduate Studies may meet to determine whether or not to proceed with the final examination.

3.8.4.3.2 University examiner's report for doctoral candidates

The university examiner shall prepare a report of his/her assessment of the candidate's dissertation and send it to the Dean of Graduate Studies or designate no less than one week before the scheduled exam date. The Dean of Graduate Studies may postpone the final examination if the university examiner's report is not received by this deadline.

The dean or designate will distribute copies of the report to all other members of the examining committee. The content of the report is

confidential and must not be discussed with the candidate prior to the final examination. Depending on the content of the report, the examining committee and the Dean of Graduate Studies may meet to determine whether or not to proceed with the final examination.

3.8.4.4 Approval for the oral examination

Before an oral examination can be held, the supervisory committee must approve the thesis for examination (no more than one negative vote and/or abstention). The student's work must be submitted at least four weeks prior to the proposed oral examination.

3.8.4.5 Examination procedure

Once the thesis has been deemed ready for examination, the chair of the examining committee is responsible for ensuring that all necessary arrangements are made. This includes sending the thesis to the external examiner, setting the examination date and preparing the relevant documents needed at the time of the examination.

If a member of the examining committee finds that he or she is unable to attend the oral examination, the graduate program director should secure a suitable replacement. Should a suitable replacement not be found, the member is asked to submit his or her questions or concerns to be read by the examining committee chair at the defence. In extraordinary circumstances, the examination will be rescheduled if one or more members of the examining committee are unable to attend.

There are three main phases to the thesis defence: the presentation phase, the question phase and the deliberation phase.

The presentation phase is the oral presentation by the candidate. This short presentation, of approximately 20 minutes, summarizes the main arguments and findings of the work.

Normally, the presentation is an open event that can be attended by all interested parties; however, extraordinarily, the presentation may be closed to a restricted audience, or no audience, for reasons of confidentiality, safety or intellectual property. In some cases, committee and audience members may be asked to sign a non-disclosure agreement. The chair of the examining committee, in consultation with the graduate program director and the research supervisor, will determine whether the defence is open or closed. The reasons for closing a defence are to be provided in the chair's report to the Office of Graduate Studies.

The question phase is the second component of the defence. In all cases, the candidate must answer questions from the examining committee. The chair will determine whether the audience is allowed to stay for the question phase of the examination and, if they do stay, whether they are permitted to participate in questioning the candidate. The chair shall limit the amount of time for questions from the audience, if applicable, and may continue with questions from the examining committee after the audience has left the room. Questions must be related to the work done by the student for the thesis and be based on knowledge directly related to the material. Only speakers recognized by the chair may ask questions, and the chair controls the order and flow of questioning. The chair can also ask questions.

The deliberation phase is the third major part of the defence. When the question phase is over, the student is asked to leave the room and members of the examining committee determine the outcome of the oral examination. All decisions of the examining committee are made by majority vote. The chair of the examining committee is a non-voting member, unless the chair's vote is needed to break a tie.

3.8.4.6 Outcomes of completion of the oral examination

A thesis is ultimately graded as a Pass or a Fail and these are the only grades that are on the transcript. In addition, there are possibilities for revision available as part of the process leading to a final grade of Pass or Fail. The examining committee renders one of the following four evaluations:

1. Acceptable without Required Revisions

An evaluation by the committee of Acceptable without Required Revisions means that the thesis is acceptable without any further editorial work. A thesis that is so evaluated is given a grade of Pass, subject only to the reproduction of the thesis and its submission to the Office of Graduate Studies. Any minor discretionary edits (e.g., spelling, grammar, table numbering) that are made before the final thesis is submitted must be approved by the research supervisor and cannot alter the thesis in any substantial way.

2. Acceptable with Minor Revisions

An evaluation by the committee of Acceptable with Minor Revisions means that there are no fundamental changes to the thesis required by the committee. Minor revision requirements are changes or additions that

normally should be able to be accomplished within four weeks. The supervisor will normally be tasked with approving these revisions, but the chair may designate other member(s) of the committee to supervise the edit if this will expedite the process. A maximum of two examiners can supervise minor revisions. A thesis that is Acceptable with Minor Revisions will be given a grade of Pass when the revisions have been approved and when the completed thesis is reproduced and submitted to the Office of Graduate Studies.

3. Major Revisions Required

A thesis that has the potential to be acceptable after major revisions will be evaluated as Major Revisions Required. Any revisions so mandated must be able to be completed within a maximum of six months. A thesis can be evaluated as Major Revisions Required only once. The committee shall decide how the revised thesis will be examined. Re-examination options include the following: a full repeat of the oral exam; an oral defence without an audience in front of the examining committee, or a subset of the examining committee; or editorial supervision by the supervisor and a second reader. There must always be two examiners at minimum (normally including the supervisor) for major revisions. Although a subset of the examining committee can approve major revisions, a full examining committee (optionally including an external examiner) must determine that a revised thesis is not acceptable and receives a grade of Fail.

4. Not Acceptable

The examining committee may evaluate a thesis as Not Acceptable if it does not meet the standards for the discipline or the area of study. A thesis can be evaluated as Not Acceptable in the first attempt at a defence if it is found to be fundamentally flawed and beyond revision in six months. In this type of case, the committee will have decided that there is no reasonable prospect of success with a revision.

Detailed reasons for failure must be submitted by the chair of the examining committee to the Dean of Graduate Studies, the graduate program director and the candidate within two weeks. The thesis is given a final grade of Fail.

3.8.5 Project or major paper evaluation

The research supervisor or co-supervisors and at least one other reader shall evaluate the project or major paper. Readers are appointed by the

graduate program director from among the graduate faculty or associate graduate faculty for the program. All evaluations must be accompanied by a report that outlines the reasons for the decision.

The supervisor(s) and reader(s) will assign one of the following four evaluations:

- Acceptable without Required Revisions.
- Acceptable with Minor Revisions.
- Major Revisions Required.
- Not Acceptable.

In cases where all the submitted evaluations are Acceptable without Required Revisions, a grade of Pass will be given.

In cases where at least one evaluation is Acceptable with Minor Revisions and there are no Major Revisions Required or Not Acceptable evaluations, the research supervisor ensures that the student's work is revised to respond to the recommended minor revisions. Normally, these revisions must be completed within four weeks. Minor revisions must not fundamentally change the content of the project or major paper. Upon the satisfactory completion of the revisions, a grade of Pass will be submitted for the student.

In cases where at least one evaluation is Major Revisions Required and there are no Not Acceptable evaluations, the research supervisor ensures that the student's work is revised to respond to the recommended changes. These revisions must be completed within six months. After these revisions are complete, the student's project or major paper is circulated a second time for evaluation by the research supervisor or co-supervisor and at least one other reader appointed by the graduate program director. Any evaluation of Major Revisions Required or Not Acceptable from the second reading results in a grade of Fail. Any evaluation of Acceptable without Revisions or Acceptable with Minor Revisions will be processed accordingly and the student will be given a grade of Pass.

In cases where there are at least two Not Acceptable evaluations, the student will be given a grade of Fail.

In cases where there is only one Not Acceptable evaluation, the graduate program director will meet with the research supervisor and the student

within two weeks. The graduate program director chooses one of two options after this consultation:

- The graduate program director sends the project or major paper to another reader within four weeks. The project or major paper may incorporate only minor revisions. If the new reader determines that the project or major paper is either Acceptable without Revisions, Acceptable with Minor Revisions or Major Revisions Required, the evaluation of the student's work will continue with the appropriate level of response as outlined above for the decision that requires the greatest revision. If the new reader evaluates the work as Not Acceptable, the student will have then received a second Not Acceptable and is given a grade of Fail.
- The graduate program director follows the procedures associated with Major Revisions Required.

3.8.6 Thesis, project or major paper notation

Upon acceptance of the student's thesis, project or major paper, the title of the work and date of approval are recorded on the transcript.

3.8.7 Permission to withhold thesis from public domain

If, at the time of submitting his/her thesis, the student elects to protect any rights to immediate commercial publication, or to obtain a patent which may arise from his/her research, or to keep his/her thesis out of circulation for other reasons, he/she may apply in writing to the Dean of Graduate Studies requesting that the thesis be withheld from the public domain for a period of up to 12 months from the date of successful defence.

The student must submit any request for extension of the restriction of circulation one month prior to the termination of the previous period. The student and his/her supervisor are required to justify the extension of the restriction. Subsequent requests must follow the same procedure.

This request must be made when the thesis is first submitted to the Office of Graduate Studies.

3.8.8 Submission of student work

Once a student's thesis, project or major paper has been approved, the student must submit the work formally. The following procedures and conditions apply:

1. One bound copy and one electronic copy of the original thesis, project or major paper become UOIT property.
2. The student grants UOIT a royalty-free, non-exclusive license to make copies of the work for academic purposes at UOIT and upon request from other universities or bona fide institutions.
3. The international copyright symbol (©) is displayed prominently on the title page of the thesis or displayed with similar prominence on other types of work.
4. The site licence, signed by the student at the start of the program, takes effect; the site licence permits the UOIT library to circulate as part of its collection and/or copy the work for academic purposes only (the university's copyright notice is placed on all copies made under the authority of the licence).
5. While the site licence excludes the sale of authorized copies for profit, UOIT may recover duplication costs through a fee.
6. Every copy made available under the licence clearly states that the copy is being made available in this form with full consent of the copyright owner and only for the purposes of private study or research.
7. UOIT may submit the work to the National Library of Canada, which is permitted to reproduce and lend copies for educational or research use only.

3.9 Intellectual property

Intellectual property comprises original work which often takes various forms such as research data, books, journal papers, theses, projects, photographs, computer programs, websites, equipment, devices or audio recordings.

3.9.1 Students and ownership of intellectual property

Students, as well as faculty members and researchers, may create intellectual property. This may be done individually or in collaboration with one or more students, the student's research supervisor or faculty advisor, or other faculty members.

UOIT's Intellectual Property policy generally states that creators own their work. As a result, student rights are treated as equivalent to those of all other academic personnel, including faculty members.

When a student works collaboratively with other students, the student's research supervisor, or other UOIT faculty members or researchers, credit for the work is generally shared among the research collaborators. To be considered for joint authorship, all collaborators must have made a significant contribution to the concept, design, collection, analysis or interpretation of the data and helped write and revise the draft publication for intellectual content.

In addition, as the Student Contributors section of UOIT's Research Guidelines states, "A student should be granted due prominence on the list of co-authors for any multiple-authored article or report that is based primarily on the student's own work, according to the commonly accepted practice in the field."

3.9.2 Students and ownership of externally funded research

While jointly created intellectual property is owned jointly, other ownership rules may apply when a student participates in a project that is funded by externally sponsored contracts or grants. In such cases, the sponsoring organization or any contractual agreement with UOIT may determine ownership and control of intellectual property.

Students should discuss with their research supervisor or faculty advisor whether any such conditions apply to the student's work. Nevertheless, an external organization or agency may not delay completion of a student's thesis, project or major paper. Only in special circumstances may an outside organization or agency be permitted to temporarily delay public dissemination of such student work.

If the work has commercial value, the student, in conjunction with other co-creators of the work, may wish to apply for a patent or other intellectual property protection. Upon request, UOIT will assess the commercial value of the work and may agree to pay for these costs and manage the intellectual property commercialization process on behalf of the creators. In all cases, commercialization activities require authorization from the Vice-President, Research, Innovation and International to confirm that obligations to UOIT and any research sponsors have been met and will continue to be satisfied.

3.10 Academic conduct

3.10.1 Academic conduct

Graduate students and faculty members share an important responsibility to maintain the highest standards of quality, integrity and honesty in their academic work. These standards are founded on the principles of mutual trust, rigorous scholarly exchange and respect for the intellectual property of others. Academic misconduct at the graduate level is an offence against the integrity of the university community and is punishable by appropriate disciplinary action.

It is presumed that graduate students appreciate the fundamental principles of good scholarship, are aware of the actions that constitute academic misconduct and understand the seriousness of the consequences that may result from acts of misconduct when they are found to exist. A lack of familiarity with the university's policy on academic conduct on the part of a student does not constitute a defence against its application.

3.10.2 Academic misconduct

Academic misconduct includes, but is not limited to, the following:

- Unreasonable infringement on the freedom of other members of the academic community (e.g., disrupting classes or examinations, harassing, intimidating or threatening others).
- Cheating on examinations, assignments, reports or other work used to evaluate student performance. Cheating includes, but is not limited to, copying from another student's work or allowing one's own work to be copied; submitting another person's work as one's own; consulting with an unauthorized person during an examination; using unauthorized aids; submitting work prepared in collaboration with other member(s) of a class when collaborative work on a project has not been authorized by the instructor; and improperly obtaining examination papers, tests or similar materials, and/or using or distributing such materials.
- Impersonating another student or allowing oneself to be impersonated for purposes of taking examinations or carrying out laboratory or other assignments.
- Plagiarism, which is the act of presenting the ideas, words or other intellectual property of another as one's own. The use of other people's work must be properly acknowledged and referenced in all written material. The work of others may include, but is not limited to, images,

designs, processes, computer software, digital, audio and video files, and Internet resources.

- Submission of work for evaluative purposes when a major portion has been previously submitted or is being submitted for evaluation by another instructor without the express permission of all instructors involved.
- Aiding and abetting others in acts of academic misconduct.
- Fabrication or falsification of information, citation or result in an academic exercise. Falsification does not include those factors intrinsic to the process of academic research such as honest error, conflicting data, or differences in interpretation or assessment of data or experimental design.
- Deliberate destruction of or tampering with one's own research data or that of others, or other practices that deviate significantly from those which are commonly accepted as appropriate within scholarly communities.
- Failure to comply with university policy or with relevant federal or provincial statutes or regulations for the protection of researchers, human participants or the health and safety of the public or the welfare of animals.
- Falsification of academic records, submission of false credentials or misrepresentation of facts for the purpose of gaining academic advantage or for any other purpose.
- Professional unsuitability, such as behaviour inconsistent with the norms and expectations of the profession.

3.10.3 Procedures

With respect to all accusations of academic misconduct, students are presumed innocent until the contrary has been established. Decisions regarding the commission of academic misconduct or professional unsuitability are based on the balance of probabilities. A record of all allegations of misconduct, along with details of the resolution, will be entered into the central academic records kept by the Office of Graduate Studies.

Faculty, staff or students who have reason to believe that an academic offence has been committed should report the matter promptly to the appropriate dean(s) responsible. If the alleged academic offence occurs within a course, then the initial dean(s) for the allegation is/are the course dean(s). There also may be separate deans for the program in which the

student is enrolled or for the student's supervisor. Should there be more than one dean involved, they will establish which dean(s) shall be responsible for addressing the complaint. In the case of allegations of misconduct in research and scholarship, there shall be an appropriate level of inquiry into the matter prior to the submission of a report on the offence, consistent with UOIT's policy on Integrity in Research and Scholarship.

The dean(s) shall establish a graduate integrity committee comprised of a dean's delegate and two members of the graduate faculty to investigate the complaint and recommend resolution. A student will not be permitted to withdraw from his/her courses or program until the matter is resolved and sanction imposed, if applicable.

The dean or his/her delegate must inform the student in writing of the allegations, the possible sanctions and provide the student with a copy of the pertinent policy statement. The student will be given 10 working days to prepare a response. The Graduate Integrity Committee will then meet with the student to hear the response. The student is entitled to be accompanied by up to two advisors at this meeting, provided the identity of the advisors is given no less than 48 hours before the meeting.

The committee shall then conduct a thorough investigation of the allegations and response, and make its recommendation to the dean within 10 further working days. The dean will notify the parties of the decision in writing. A copy of the decision will be provided on a need-to-know basis to administrative units (e.g., other faculties, the Office of Graduate Studies).

3.10.4 Sanctions

If a student is deemed to have committed academic misconduct, one or more of the following disciplinary sanctions may be imposed. The sanctions will be determined by the nature of the offence. Sanctions may include, but are not limited to, the following:

- A written reprimand warning the student that the behaviour was unacceptable and that further misconduct will lead to additional sanctions. A copy of the reprimand will be placed in the student's file, but no notation will appear on the academic record.
- Submission of a failing grade in a course.
- Disciplinary probation for the remainder of the student's registration in his/her current program of study. A note to this effect will be placed in

the student's file, and a notation may appear on his/her academic record.

- Expunging of grades or revoking of degrees.
- Suspension from attendance from the university for a period not less than one term (fall or winter) and not exceeding three years as deemed appropriate. While suspended, a student may not register and loses the right to attend lectures, write examinations and receive payment from university sources. Courses taken elsewhere during the period of suspension are not eligible for transfer credit. Notice of suspension will be placed in the student's file and will appear on his/her academic record. The conditions of suspension will specify the length of time such notice will remain on the student's academic record.
- Permanent expulsion from the university. A note to this effect will be placed in the student's file and will remain on his/her academic record.
- Such other sanctions as deemed appropriate.

3.10.5 Transcript notations

Transcript notations for academic misconduct will include the following range of notations: grade of F assigned for [course number] for academic misconduct; suspended for academic misconduct for [dates of suspension]; and permanently expelled for academic misconduct.

3.10.6 Appeals

Decisions of deans relating to academic misconduct may be appealed to the Graduate Studies Committee of Academic Council. The student is given 10 working days to gather new evidence and to submit a letter of appeal to the Graduate Studies Committee. Under normal circumstances, disciplinary penalties will not be imposed before an appeal is decided, nor will official transcripts be issued during this period. Formal registration may be revoked where warranted. In the case of suspected professional unsuitability, a student may be withdrawn from classes, practica, work placements or other program related activities pending the resolution of the case.

A student may apply to the Dean of Graduate Studies for continued attendance in classes and related activities while the appeal is being heard. In order for such a request to be granted, the dean must be satisfied that there would be no detrimental effect of such continued attendance. If the appeal is granted, formal registration will be reinstated.

3.10.6.1 Graduate academic appeals procedures

1. Appeals shall be heard by a panel of a minimum of three committee members. Committee members are determined by the Dean of Graduate Studies and include at least one student and at least two faculty members.
2. The appeal hearing shall be chaired by the Dean of Graduate Studies, or designate, who shall be counted as one of the panel members.
3. Decisions with respect to the final disposition of an appeal will be carried by a simple majority of panel members hearing the appeal.
4. An appellant must have completed any prior levels of appeal open to him or her before filing a Notice of Appeal with the committee.
5. An appeal to the committee shall be commenced by filing a Notice of Appeal in the required form no later than 4 p.m. on the tenth working day after the date of the decision that is being appealed.
6. The chair may refuse to give a hearing to an appeal on the grounds that it is not within the jurisdiction of the committee.
7. Notwithstanding a request for an oral hearing, the panel of the committee hearing an appeal may dismiss it by unanimous decision after considering the written submissions on the grounds that there is no real case for an appeal (i.e., the appeal is frivolous or vexatious and without merit).
8. In the Notice of Appeal, the appellant shall elect whether an oral hearing is requested. If no election is made, the appeal shall be determined in writing.
9. Where an appeal is to be determined in writing:
    i. As soon as reasonably practicable, the panel shall provide a copy of the Notice of Appeal to the responding faculty.
    ii. The responding faculty has 10 working days to deliver to the panel a written response to the Notice of Appeal, attaching any documents relevant to the decision under appeal. A copy of the written response and attached documents shall be mailed to the appellant.
    iii. The appellant shall have 10 working days from the mailing date of the responding faculty’s response to provide any final written response. A copy of this shall be mailed to the faculty.

10. Where the appeal is to be determined by oral hearing:
    i. Upon receipt of the Notice of Appeal, the panel, in consultation with the appellant and the responding faculty, will schedule a date for the oral hearing.
    ii. No less than 10 working days prior to the hearing, the appellant shall deliver the following to the panel (three copies) and the responding faculty (one copy):
        a) Any written submissions to be relied upon at the hearing.
        b) Copies of all documents to be referred to at the hearing.
        c) A list of persons attending as witnesses and a brief summary of each witnesses' intended evidence.
    iii. No less than five working days prior to the hearing, the responding faculty shall deliver to the panel (three copies) and the appellant (one copy) of the material listed in paragraph 10(b), (i) to (iii) above.
11. Where the appeal is to be determined in writing, the members of the panel may convene in person or via teleconference.
12. For an oral hearing, the following procedures shall apply:
    i. At the commencement of the hearing, the chair shall identify the parties and the members of the panel.
    ii. The appellant, or a representative, shall briefly describe the case to be presented and provide factual support for the case through documentary evidence and testimony of the appellant and any witnesses, if relevant.
    iii. The responding faculty, or a representative, shall briefly reply to the appellant's case and provide facts in opposition to the case through documentary evidence and the testimony of witnesses, if relevant.
    iv. Panel members may ask questions at the conclusion of each person's statement or testimony, or at the conclusion of the appellant's or responding faculty's case.
    v. Normally, neither the appellant nor the responding faculty may ask questions of the other's witnesses. However, where facts important to the decision of the appeal are in dispute, either party may ask permission and, if appropriate, the panel may grant permission for the cross-examination of some or all witnesses.
    vi. Following the presentation of the appellant's and the responding faculty's cases, the appellant and the responding

faculty may each make brief closing statements to summarize the main points of their respective positions.

vii. Following the foregoing steps, the parties will withdraw and the panel will move in camera for its deliberations.

viii. The decision of the panel will be in writing and shall include the names of the panel and all who appeared, a brief summary of the issues on the appeal, the panel decision and reasons in support of the decision.

13. The time limits specified under these procedures may be extended by the chair at the request of the appellant or responding faculty if reasonable grounds are shown for the extension.

3.11 Student conduct

Students have a responsibility to familiarize themselves with the university regulations and the conduct that is expected of them while studying at UOIT, which includes, but is not limited to the following:

- Abiding by university regulations, policies and by-laws, and/or complying with directions of university officials, police or other law enforcement officers acting in the performance of their duties.
- Respecting the rights of other members of the university community who study, work and live within it, and refraining from conduct that endangers the physical and mental well-being, health, safety, civil or human rights and property of self and/or others within the university community or visitors to the university.
- Refraining from conduct that may damage, destroy or constitutes fraudulent use of university property.
- Refraining from conduct that jeopardizes the good order and proper functioning of the academic and non-academic programs and activities of the university and its faculties and offices.
- Refraining from making allegations or complaints against other members of the university community that are frivolous, vexatious or made in bad faith and from retaliating against individuals for participating in proceedings under this policy.
- Abiding by federal, provincial or municipal laws.

Procedures for the reporting of incidents and investigation and resolution of complaints are described in the university's Student Conduct Policy located on the university website at **uoit.ca**.

3.12 Fees and financial assistance

3.12.1 Tuition and miscellaneous service fees

To view current tuition and miscellaneous service fees, visit **gradstudies.uoit.ca/tuitionandfees**.

3.12.2 Financial assistance

Various types of financial support are available from the university, government or other sources. All are offered on a competitive basis except bursaries and OSAP assistance; these are awarded on the basis of financial need. Tuition and accommodation costs are the student's responsibility. Domestic students are strongly encouraged to apply to provincial and federal granting agencies for graduate scholarships. International students are encouraged to apply to granting agencies in their home countries.

Qualified full-time students may be eligible for financial support through research assistantships funded by their faculty supervisor's research grants, government scholarships or other merit scholarships, and/or teaching assistantships. Further details can be found at **gradstudies.uoit.ca/funding**.

The following UOIT policies and guidelines also apply to graduate studies:

- Intellectual Property
- Protection of Privacy and Access to Information
- Student Conduct

Additional information on these policies and guidelines can be found at **uoit.ca**.

Section 4: Fees and Charges

For information about specific, current fees, please visit **uoit.ca** and/or **gradstudies.uoit.ca**.

4.1 General information

Each student will be able to view a detailed assessment of fees due by viewing their student account within MyCampus. No fee statements will be mailed. Students are responsible for paying amounts owing by the fee deadlines specified in the academic schedule (see Section 1).

Students in fee-per-credit programs will have tuition and compulsory fees assessed only upon registration in courses. Therefore, students in fee-per-credit programs should register in advance of the fee deadline in order to review their assessment of fees and ensure amounts owing are paid on time. Any student who registers in courses after the first day of the term is required to pay their fees immediately and may be assessed a late payment fee.

Students in flat-fee programs will normally be enrolled in a continuance course and will therefore have their fees assessed prior to registration in courses. For further details, please see Section 3.5.6 for UOIT's policy on registration.

Students with fees outstanding beyond the due date will be assessed a late payment fee and will be subject to the university's hold policy. Students on hold are unable to register, view grades, order transcripts or graduate. Other services (e.g., library access, parking passes) may also be denied.

Students expecting to receive OSAP or awards after payment deadlines should make arrangements with the Student Accounts office within the Finance department before the tuition payment deadline. Outstanding fees must be paid before subsequent registration will be allowed.

A student in a fee-per-credit program dropping courses within the first 10 lecture days in any semester will not be liable for tuition fees for those courses. Any student in a fee-per-credit program who drops a course after the 10th day of lectures up to the 20th day of lectures will receive a 50 per cent refund of tuition fees. No tuition will be refunded for courses dropped after the 20th day of lectures. Students in fee-per-credit programs wishing

to drop courses should consult the Graduate Studies website for specific refund dates.

A student in a flat-fee program dropping a course or all courses is still responsible for tuition and fees. For further details, please see Section 3.5.6 for UOIT's policy on registration.

A student in a flat-fee program withdrawing from their program within the first 10 lecture days in any semester will not be liable for tuition fees. Any student in a flat-fee program who withdraws from their program after the 10th day of lectures up to the 20th day will receive a 50 per cent refund of tuition fees. No tuition will be refunded for program withdrawals after the 20th day.

4.2 Methods of payment and settlement

Please visit **gradstudies.uoit.ca** for full details and instructions on payment and settlement types.

4.2.1 Methods of payment

Accepted methods of payment include the following:

- Bank payment – Internet, telephone or at your bank (preferred method)
- Debit
- Money order, certified cheque or bank draft
- Wire or bank transfer – for international students

4.2.2 Methods of settlement

The promissory note for deferment of fees allows a student to defer payment of their tuition fees past the fee deadline date.

Approved funding types for deferment of fees:

- External scholarship
- OSAP
- Research assistantship
- Research grant
- Teaching assistantship
- Third-party sponsorship

Please visit **gradstudies.uoit.ca/funding** to download and print the Promissory Note for Deferment of Fees form. The deferment form must be completed and submitted by the fee deadline date.

Note: UOIT does not accept non-certified cheques, credit cards or cash for tuition and program-related fees. If you wish to remit payment via these methods, please contact your bank and remit your payment to UOIT via Internet/telephone banking.

4.3 Tuition and fees

Graduate students enrolled in a flat-fee program are charged tuition fees based on full- or part-time status in a graduate program. Students are expected to confirm their status at the time of their initial application. In addition, students are expected to be continuously enrolled and will, therefore, pay tuition and fees in each term until the completion of their program.

Graduate students enrolled in a fee-per-credit program are charged tuition fees based on the number of credits in which they have registered. Students should note that their full- or part-time status is not dependant on the number of credits or courses they take. If a student wishes to change their full- or part-time status, they must go through the formal process to do so.

A graduate student in a fee-per-credit program will be charged a continuance fee for their continuing work on a major paper, project or thesis for each term extension beyond the normal degree components. The continuation fee will be based on three credits for part-time graduate students and six credits for full-time graduate students, plus ancillary fees.

To view current tuition and other fees, please visit **gradstudies.uoit.ca/tuitionandfees**.

4.4 Ancillary and student organization fees

Ancillary and student organization fees are charged on a semester basis and are due at the same time as tuition. For further details on ancillary and student organization fees, please visit **gradstudies.uoit.ca/tuitionandfees**.

4.5 Health and dental insurance

Health and dental insurance fees are charged annually and are assessed as part of fall semester fees. These fees are charged to full-time students only. Students dropping to part-time status before the opt-out date will receive a refund of health and dental fees. The rates are determined by

the insurer. Students starting their program in the winter term or spring/summer sessions will be assessed this fee on a pro-rated basis. For more information on health and dental insurance, visit the Student Association website at **your-sa.ca**.

International students are required to pay the University Health Insurance Plan (UHIP) fees in addition to regular health and dental insurance fees. The rates are determined by the insurer. Students starting their program in the winter term or spring/summer sessions will be assessed this fee on a pro-rated basis. Additional information on UHIP is available through the International Office.

4.6 Technology-enriched learning environment

Graduate students are not required to participate in the technology-enriched learning environment but may choose to do so if they wish. For further information, please visit **itsc.uoit.ca**.

4.7 Residence and campus dining plan fees

Residence fees are charged for an eight-month period between the months of September and April. Accommodations for students wishing to stay during the summer months are also available. All students staying for the summer term will be in the South Village Residence and will be charged for a four-month period between the months of May and August. For payment deadlines, details and contact information, please visit **uoitrez.ca**.

Students living in the South Village Residence from September to April must choose one of the mandatory residence dining plans. All other students may choose to purchase a residential dining plan or one of the voluntary meal plans. Most voluntary meal plans have a tax-free status associated with them and can be utilized throughout the campus, including the Rez Express late-night food delivery service.

Residence dining plans consist of a set number of meals per week loaded directly onto student cards. Cards can then be used to purchase food from on-campus eating facilities as well as the Provisions on Demand (POD) Market, which combines the convenience of a corner store with the style and service of a modern market.

Sign up for a tax-free voluntary meal plan or residence dining plan online at **durham-uoit.campusdish.com**.

4.8 Parking

Parking rates are determined annually. Rates vary depending on the permit type. Visit **uoit.ca/parking** for more information.

Section 5: Graduate Programs Offered by the Faculty of Business and Information Technology

5.1 Contact information

Faculty of Business and Information Technology
University of Ontario Institute of Technology (UOIT)
2000 Simcoe Street North
Oshawa, Ontario L1H 7K4
Canada

905.721.8668 ext. 2830
905.721.3167 (fax)
fbit@uoit.ca, mba@uoit.ca, mits@uoit.ca
businessandit.uoit.ca

5.2 Graduate degrees offered

The following graduate degrees are offered by the Faculty of Business and Information Technology:

- Master of Business Administration (MBA)
- Master of Information Technology Security (MITS)

The Faculty of Business and Information Technology also offers a combined MBA and MITS program option.

5.2.1 Affiliated programs

The following graduate programs are affiliated with the Faculty of Business and Information Technology:

- Master of Engineering Management (offered in collaboration with the Faculty of Energy Systems and Nuclear Science and the Faculty of Engineering and Applied Science—see Section 8 for program information).
- Graduate Diploma in Engineering Management (offered in collaboration with the Faculty of Energy Systems and Nuclear Science and the Faculty of Engineering and Applied Science—see Section 8 for program information).

- Master of Science in Computer Science (offered in collaboration with the Faculty of Engineering and Applied Science and the Faculty of Science—see Section 10 for program information).
- Doctor of Philosophy in Computer Science (offered in collaboration with the Faculty of Engineering and Applied Science and the Faculty of Science—see Section 10 for program information).

5.3 Master of Business Administration

5.3.1 Graduate faculty

David Agnew, BSc, PhD

Hamid Akbari, BSc, MBA, PhD

Rajen Akalu, LLM, LLB

Jane Bowen, BCom, CA

Bin Chang, LLB, MA, MA, PhD

Cuiping Chen, BEng, MA, PhD

David Clark, BA, LL.B, LL.M

Tirtha Dhar, BA, MA, MSc, PhD

Shantanu Dutta, BTech, MEngMgmt, MBA, PhD

Rob Elkington, BTh, MMin, MTh, DMin, PhD

John Friedlan, BSc, MBA, PhD, CA

William Goodman, BA, MA, PhD

Chinmay Jain, BTech, PhD

Matthew Jelavic, BA, MEng, DBA

Ying Jiang, BA, MPhil, PhD

Salma Karray, BCom, MSc, PhD

Igor Kotlyar, BCom, MBA, PhD

Joseph Krasman, BAS, MBA, PhD

Zhenfeng Ma, BA, MA, PhD

Stephen Marsh, BSc, PhD

Peter Mason, BSc, MSc, PhD

Pejman Mirza-Babaei, PhD

Jeff Moretz, BA, MBA, PhD

Richard Pazzi, BSc, MSc, PhD

Jennifer Percival, BMath, PhD

Ryan Riordan, MBA, PhD

Pamela Ritchie, BA, MSc, PhD

John Rowcroft, BSc (Hons), MSc, PhD

Samir Saadi, MBA, PhD

Karthik Sankaranarayanan, PhD

Nicola Shaw, BSc (Hons), PhD

Kamal Smimou, BSc, MBA, PhD

Chirag Surti, BEng, MSc, PhD

William Thurber, BA, MBA

Terry Wu, BA, MA, PhD

5.3.2 Program information

The objective of the MBA program is to prepare graduates to work at the middle management and executive levels of administration in both private and public sectors. The program enables the degree holder to provide organizations with a business management skill set that helps raise the competitiveness of the entity. This not only leads to a comparative advantage but also retains higher-skilled and thus higher-income jobs within the province.

The design of the MBA program focuses on the breadth of a general management core curriculum coupled with emphasis on particular business fields. The courses emphasize not only the theoretical approach but also real-world case studies. Students learn how to apply these textbook theories in realistic examples. To facilitate this, the program draws expertise from firms and government agencies in the region to bring real-world experiences and effective

career networking to the classroom. These firms and agencies also provide the basis for the program's required research project. The MBA program is also supported by specialist facilities such as the faculty's Marketing Research Lab and its Virtual Trading Lab in Finance.

The MBA is directed towards students looking for deeper knowledge and experience in one of the program's fields. These degree paths provide students with the opportunity to explore management problems in a particular area at a more theoretical level and hence prepare them for further graduate study if they wish.

The MBA provides the opportunity for students to specialize in one of five fields:

- Finance
- International Business
- Logistics and Supply Chain Management
- Marketing
- Technology Management

Note: Not all fields are necessarily offered each year.

Finance and marketing are two fundamental areas of graduate business study in strong and consistent demand. International business is also strongly represented, but the approach at UOIT follows recent practice by offering a further examination of global business through its impact on other specializations such as finance, marketing and management. Logistics and supply chain management has emerged as a crucial area of study covering production planning, warehousing, and inventory optimization and transportation. UOIT is one of the first universities in Canada to offer this as a field at the MBA level. Technology Management takes special advantage of the faculty's combined strengths in business and information technology.

For students with at least two years of relevant work experience, the MBA program builds on employment experiences and can be completed in 16 months of full-time study. For students with less than two years of relevant work experience, there is the opportunity to integrate MBA studies with work placements in a 24-month schedule of full-time study. Previous relevant work experience, such as a co-op placement, can reduce the work requirement for this option. Spaces in the full-time integrated work placement option are limited by the availability of work placements.

Many part-time students integrate their work commitments with their MBA studies. Many courses are scheduled in the evenings to accommodate part-time MBA students.

5.3.3 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, MBA applicants must meet the following program-specific requirements:

- Minimum overall academic standing of a B (GPA: 3.0 on a 4.3 scale), with a minimum of B+ in the last two full-time years (four semesters) of undergraduate work or equivalent.
- Submission of a third letter of recommendation from a person having direct knowledge of the applicant's professional and/or academic competence to succeed in the MBA program. A former or present supervisor from employment may be considered.
- Minimum required test score on the Graduate Management Admission Test (GMAT) or Graduate Record Examination (GRE). See GMAT and GRE Scores for minimum required scores.
- In their statement of academic intent, applicants should explain their background, reasons for pursuing a MBA and career goals. See Statement of Academic Intent for additional instructions.
- Submission of a resumé.
- Minimum two years of work experience or equivalent for the 16-month full-time program or its part-time equivalent. Applicants with less than two years of work experience may be considered for the integrated work placement option.
- If applicable, a minimum score of 580 on the paper-based TOEFL, 92-93 on the Internet-based TOEFL or 7 on the IELTS. Note that these English language proficiency scores are slightly higher than those required for some other graduate programs at UOIT. Language requirements are specified in Section 3.4.4.

Individuals without an undergraduate degree who have extensive business experience may be considered on a case-by-case basis. For more information, see Section 3.4.8 for UOIT's policy on non-standard applicants.

Admission is competitive and subject to availability of space. Accordingly, satisfaction of minimum entry conditions does not ensure admission.

GMAT and GRE scores

Applicants must submit either a GMAT or GRE test score as part of their application. The minimum required scores are as follows:

GMAT: minimum score of 550.

GRE Revised General Test: minimum score of 316, with no less than 150 on the Verbal Reasoning Test and 155 on the Quantitative Reasoning Test.

GRE General Test: minimum score of 1140, with no less than 470 on the Verbal Reasoning Test and 530 on the Quantitative Reasoning Test.

Note: The GMAT/GRE requirement may be waived for four-year honours degree graduates with an average of A-minus in the last two years of their degree or for honours business degree graduates with a B+ average in the last two years of their degree.

Statement of academic intent

The statement of academic intent should provide essential information about the applicant's qualifications, including the following:

- An assessment of strengths and gaps in experience/education.
- How a MBA program will bridge the applicant's past and future and how it will fill the gaps in experience/education.
- Long- and short-term goals.
- Relevant past experience.
- Why the UOIT MBA is a good match with the applicant's needs.

5.3.4 Part-time studies

The MBA is offered on a part-time and full-time basis. The structure of the program is such that part-time students may flow through it while fulfilling all prerequisite requirements. Scheduling of courses is designed to facilitate this.

5.3.5 Degree requirements

Students in the MBA are required to successfully complete 11 required courses, four courses in their chosen field and an applied research project on a local or global business problem for a total of 52 credits.

Proposed progression through program

Year 1

Semester 1
BUSI 5000G Business Communication*
BUSI 5010G Foundations of Business
BUSI 5100G Accounting Systems
BUSI 5200G Marketing Management
BUSI 5400G Quantitative Analysis in Business

Semester 2
BUSI 5410G Financial Management
BUSI 5500G Management Information Systems
BUSI 5600G Operations and Project Management
BUSI 5800G International Business
Course selected from program field**

Semester 3
BUSI 5020G Ethics and Leadership
BUSI 6700G Strategic Management
Two courses selected from program field**
BUSI 6920G MBA Research Project I

Year 2

Semester 1
Course selected from program field**
BUSI 6930G MBA Research Project II
BUSI 6940G MBA Research Project III

This program map is designed for full-time students who begin their studies in the fall semester. Part-time students should consult with the graduate program director to determine their study plans.

*Students must register in and complete BUSI 5000G Business Communication during the first week of September, prior to the commencement of any further courses.
** Refer to Section 5.3.5.1 through 5.3.5.5 for detailed requirements for each field.

5.3.5.1 Finance field

Students in the Finance field must take BUSI 6410G Global Finance. An additional three courses must be selected from the following:

BUSI 5450G Business Forecasting Techniques
BUSI 6090G Special Topics in Business
BUSI 6420G Equity Securities
BUSI 6430G Fixed Income Securities
BUSI 6440G Derivative Strategies
BUSI 6450G Portfolio Management

5.3.5.2 International Business field

Students in the International Business field must take BUSI 6250G Global Marketing, BUSI 6410G Global Finance and BUSI 6810G Global Management. A fourth course must be selected from the following:

BUSI 5300G Organizational Behaviour
BUSI 5510G E-Commerce Strategies
BUSI 5700G Entrepreneurship
Elective (chosen from another field)

5.3.5.3 Logistics and Supply Chain Management field

Students in the Logistics and Supply Chain Management field must take BUSI 5640G Optimization and BUSI 5650G Supply Chain Management. An additional two courses must be selected from the following:

BUSI 5420G Discrete Event Simulation Modeling
BUSI 5450G Business Forecasting Techniques
BUSI 6090G Special Topics in Business
BUSI 6630G Inventory and Logistics in Supply Chain Management
BUSI 6650G Advanced Supply Chain Management
BUSI 6660G Impact of Technology on the Supply Chain

5.3.5.4 Marketing field

Students in the Marketing field must select four courses from the following:

BUSI 5450G Business Forecasting Techniques
BUSI 6090G Special Topics in Business
BUSI 6210G Consumer Behaviour
BUSI 6220G Marketing Strategy
BUSI 6230G Internet Marketing
BUSI 6250G Global Marketing
BUSI 6260G Marketing Research

5.3.5.5 Technology Management field

Students in the Technology Management field must take MITS 5100G Law & Ethics of IT Security and BUSI 5710G Strategic Information Technology Management. An additional two courses must be selected from the following:

BUSI 5420G Discrete Event Simulation Modeling
BUSI 5450G Business Forecasting Techniques
BUSI 5510G E-Commerce Strategies
BUSI 5610G Knowledge Discovery and Data Mining
BUSI 6090G Special Topics in Business
BUSI 6230G Internet Marketing
BUSI 6660G Impact of Technology on the Supply Chain
MITS 5600G Security Policies and Risk Management
MITS 5610G Special Topics in IT Security
MITS 5620G Special Topics in IT Management

5.4 Master of Information Technology Security

5.4.1 Graduate faculty

David Clark, BA, LL.B, LL.M

Khalil El-Khatib, BCompSc, MCompSc, PhD

Shahram S. Heydari, BSc, MSc, MASc, PhD

Shih-Chia Huang, PhD

Patrick C.K. Hung, BSc, MPhil, MASc, PhD

Chinmay Jain, BTech, PhD

Xiaodong Lin, BSc, MSc, PhD, PhD

Stephen Marsh, BSc, PhD

Carolyn McGregor, BAppSc (Comp.Sc), PhD

Richard Pazzi, BSc, MSc, PhD

John Rowcroft, BSc (Hons), MSc, PhD

Ryan Riordan, MBA, PhD

Samir Saadi, MBA, PhD

Nicola Shaw, BSc (Hons), PhD

Jay Shiro Tashiro, RN, BSN, PhD

Julie Thorpe, BCompSci, PhD

Miguel Vargas Martin, BSc, MASc, PhD, PEng

Ying Zhu, BSc, MSc, PhD

5.4.2 Program information

The MITS program is a graduate professional program that prepares graduates to work in the high-demand IT security industry. The program is designed to enable students to learn how to learn in the rapidly evolving IT security field. The program adopts a project method that provides students with the experience to apply core course materials to a substantial project in the workplace during the latter part of the program.

The MITS program is one of the first of its kind in Canada and one of few specialized IT security graduate degree programs available in the world. Through theory and applied learning, the program enables students to develop an extensive understanding of business and information technology security, polish communication skills and examine business and IT ethics in a team environment.

To achieve the objectives of the program and to enhance students' learning experience, it is important for the program to provide students with the necessary hands-on skills and knowledge. The Faculty of Business and Information Technology provides a Hacker Research Lab to enhance the curriculum of the MITS program. This lab facility hosts an array of network settings and consists of a variety of network equipment and wireless devices in a secure setting. It offers

students a secluded environment within which to work on various IT security projects and experiments.

The MITS curriculum contains the domains found in the Certified Information Systems Security Profession (CISSP) exam. The curriculum, which includes an IT security capstone project, also provides students with the opportunity to apply core course concepts to a substantial project in the workplace. This plan of study introduces students to the fundamental knowledge of the ever-changing IT security field. MITS graduates will not only be able to understand and apply the best of current practice but will also be able to act as managers of transformation to improve that practice as the field evolves. MITS graduates are prepared to work in different levels as IT security professionals.

5.4.3 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, MITS applicants must meet the following program-specific requirements:

- While applicants may hold any four-year undergraduate degree from an accredited institution, preference is given to applicants whose undergraduate degree is in the field of IT, engineering, science or related fields.
- Work experience in IT-related jobs is preferred.
- Submission of a portfolio indicating relevant work experience and skills in IT.
- Successful completion of at least one course in advanced programming (e.g., Java/C/C++/C#) and advanced mathematics (e.g., linear algebra, calculus, number theory, etc.), and at least one course or proven work experience in operating systems (Windows and/or Unix or Linux). To assist with the assessment of the application, applicants should submit detailed descriptions of any completed courses in these areas. Course descriptions should be copied from the university's academic calendar.

5.4.4 Part-time studies

Students can complete this program on a part-time basis, but because the IT security field changes rapidly, any students who wish to pursue security certification are encouraged to enrol full-time. It is essential that part-time students seek approval from their faculty advisor or the graduate program director regarding their study plan.

5.4.5 Degree requirements

Students are required to complete eight required courses and a capstone research project for a total of 30 credits. Students must also successfully complete the non-credit MITS 5900G MITS Seminar course. Approximate time for program completion, based on full-time status, is 12 months.

Proposed progression through program

Semester 1
MITS 5100G Law & Ethics of IT Security
MITS 5400G Secure Software Systems
MITS 5500G Cryptography and Secure Communications (cross-listed with ENGR 5670G and CSCI 5310G)
MITS 5900G MITS Seminar*
MITS 6400G Biometrics/Access Control and Smart Card Technology

Semester 2
MITS 5200G Advanced Communication Networks (cross-listed with ENGR 5660G and CSCI 5300G)
MITS 5300G Operating Systems Security
MITS 5600G Security Policies and Risk Management
MITS 6300G IT Security Capstone Research Project I**

Semester 3
MITS 6100G Attack and Defence
MITS 6600G IT Security Capstone Research Project II

This program map is designed for full-time students who begin their studies in the fall semester. Part-time students should consult with the graduate program director to determine their study plans.

*MITS 5900G MITS Seminar continues in the second semester and concludes in third semester.
**Students present their capstone projects at the end of the third semester.

5.5 Master of Business Administration and Master of Information Technology Security combined program

5.5.1 Graduate faculty

David Agnew, BSc, PhD

Rajen Akalu, LLM, LLB

Hamid Akbari, BSc, MBA, PhD

Jane Bowen, BCom, CA

Bin Chang, LLB, MA, MA, PhD

Cuiping Chen, BEng, MA, PhD

David Clark, BA, LL.B, LL.M

Tirtha Dhar, BA, MA, MSc, PhD

Shantanu Dutta, BTech, MEngMgmt, MBA, PhD

Khalil El-Khatib, BCompSc, MCompSc, PhD

Rob Elkington, BTh, MMin, MTh, DMin, PhD

John Friedlan, BSc, MBA, PhD, CA

William Goodman, BA, MA, PhD

Shahram S. Heydari, BSc, MSc, MASc, PhD

Shih-Chia Huang, PhD

Patrick C.K. Hung, BSc, MPhil, MASc, PhD

Chinmay Jain, BTech, PhD

Matthew Jelavic, BA, MEng, DBA

Ying Jiang, BA, MPhil, PhD

Salma Karray, BCom, MSc, PhD

Igor Kotlyar, BCom, MBA, PhD

Joseph Krasman, BAS, MBA, PhD

Xiaodong Lin, BSc, MSc, PhD, PhD

Zhenfeng Ma, BA, MA, PhD

Stephen Marsh, BSc, PhD

Peter Mason, BSc, MSc, PhD

Carolyn McGregor, BAppSc (Comp.Sc), PhD

Pejman Mirza-Babaei, PhD

Jeff Moretz, BA, MBA, PhD

Richard Pazzi, BSc, MSc, PhD

Jennifer Percival, BMath, PhD

Ryan Riordan, MBA, PhD

Pamela Ritchie, BA, MSc, PhD

John Rowcroft, BSc (Hons), MSc, PhD

Samir Saadi, MBA, PhD

Karthik Sankaranarayanan, PhD

Nicola Shaw, BSc (Hons), PhD

Kamal Smimou, BSc, MBA, PhD

Chirag Surti, BEng, MSc, PhD

Jay Shiro Tashiro, RN, BSN, PhD

Julie Thorpe, BCompSci, PhD

William Thurber, BA, MBA

Miguel Vargas Martin, BSc, MASc, PhD, PEng

Terry Wu, BA, MA, PhD

Ying Zhu, BSc, MSc, PhD

5.5.2 Program information

The combined MBA and MITS program is a graduate professional program that prepares graduates to work in the high-demand field of IT security management. The courses within the MBA program enable the degree holder to provide organizations with a business management skill set that helps raise the competitiveness of the entity, leading not only to a comparative advantage but also higher-skilled and thus higher-income jobs within the province. The MITS courses prepare graduates to work in the high-demand IT security industry. The MBA-MITS combined program not only emphasizes excellence in graduate-level business and IT security knowledge but also soundness in the soft skills (i.e., interpersonal relations, team building and communication) and in business and IT ethics. The program adopts a project method that provides students with the experience to apply core course materials to a substantial project in the workplace during the latter part of the program.

5.5.3 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, applicants to the MBA-MITS combined program must meet the individual admission requirements for both the MBA and MITS. Please refer to Sections 5.3.3 and 5.4.3 for program-specific admission requirements.

5.5.4 Part-time studies

To facilitate access to all potential students, part-time studies are permitted.

5.5.5 Degree requirements

Students are required to complete 19 required courses and an integrated capstone research project for a total of 64 credits. Approximate time for program completion, based on full-time status, is 20 months.

Proposed progression through program

Year 1

Semester 1
BUSI 5000G Business Communication
BUSI 5010G Foundations of Business
BUSI 5100G Accounting Systems
BUSI 5200G Marketing Management
BUSI 5400G Quantitative Analysis in Business
MITS 5100G Law & Ethics of IT Security

Semester 2
BUSI 5410G Financial Management
BUSI 5600G Operations and Project Management
BUSI 5800G International Business
MITS 5200G Advanced Communication Networks
MITS 5300G Operating Systems Security

Semester 3
BUSI 5020G Ethics and Leadership
BUSI 6700G Strategic Management
BUSI 5710G Strategic Information Technology Management
MITS 6100G Attack and Defence

Year 2

Semester 1
MITS 5500G Cryptography and Secure Communications
MITS 6400G Biometrics/Access Control and Smart Card Technology
MITS 5400G Secure Software Systems

Semester 2
MITS 5600G Security Policies and Risk Management

Nine credits, chosen in consultation with the supervisor and graduate program director, from the following:

BUSI 6920G MBA Research Project I (3 credits)
BUSI 6930G MBA Research Project II (3 credits)
BUSI 6940G MBA Research Project III (3 credits)
MITS 6300G IT Security Capstone Research Project I (3 credits)
MITS 6600G IT Security Capstone Research Project II (3 credits)

Note: Students will also be required to complete a non-credit seminar course (MITS 5900G MITS Seminar).

This program map is designed for full-time students who begin their studies in the fall semester. Part-time students should consult with the graduate program director to determine their study plans.

Section 6: Graduate Programs Offered by the Faculty of Education

6.1 Contact information

Faculty of Education
University of Ontario Institute of Technology (UOIT)
11 Simcoe Street North, PO Box 385
Oshawa, Ontario L1H 7L7
Canada

905.721.3181 (automated)
905.721.1707 (fax)
edugrad@uoit.ca
education.uoit.ca

6.2 Graduate programs offered

The following graduate programs are offered by the Faculty of Education:

- Master of Arts (MA) in Education
- Master of Education (MEd)
- Graduate Diploma in Education and Digital Technologies

6.3 Graduate faculty

Wendy Barber, BPHE, BEd, MEd, PhD

Elizabeth Childs, BSc (Hons), BEd, MEd, PhD

Suzanne deCastell, BA (Hons), MA, PhD

Francois Desjardins, BA, BEd, PhD

Maurice DiGiuseppe, BSc, BEd, MEd, PhD

Allyson Eamer, BA, BEd, MEd, PhD

Jim Greenlaw, BA (Hons), BEd, MA(T), PhD

Celia Haig-Brown, BA, MA, PhD

Wendy Hardman, BScA, MEd, PhD

Daphne Heywood, BA, DipEd, MEd, PhD

Janette Hughes, BA, BEd, MEd, PhD

Bill Hunter, BA, PhD

Robin Kay, BSc, MA, PhD

Ann LeSage, BSc (Hons), BEd, MEd, PhD

Jia Li, BA, MEd, PhD

Ami Mamolo, BSc (Hons), MSc, PhD

Maggie McPherson, BEd, MSc, PhD

Rachel Muehrer, BA, MA, PhD

Bill Muirhead, BA, MA, PhD

Diana Petrarca, BSc (Hons), BEd, MEd, EdD

Laura Pinto, BCom (Hons), BEd, MEd, PhD

Lorayne Robertson, BA, BEd, MEd, EdD

Nick Scarfo, BA, MEd, PhD

Dianne Thomson, BA, MA, PhD

Kelleen Toohey, BA, MEd, PhD

Shirley Van Nuland, BA, BEd, MEd, PhD

Roland Van Oostveen, BSc (Hons), MEd, PhD

6.4 Program information

At UOIT, the graduate programs in Education are designed specifically to prepare future leaders and specialists in learning and technology. The MA in Education, MEd and Graduate Diploma in Education and Digital Technologies are unique and at the leading edge in both their objectives and approaches to learning online. The programs deal with the most recent issues around the interactions between digital technology and education, and the professors approach these issues using techniques that favour collaborative learning, co-construction of knowledge and peer tutoring. The field of Education and Digital Technologies within the MA, MEd and the Graduate Diploma builds on the institutional strengths of information and communication technologies at UOIT.

Students enrolled in all graduate programs in Education will take their courses completely online, which includes weekly video conferencing meetings.

6.5 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, MA, MEd and Graduate Diploma in Education and Digital Technologies applicants must meet the following program-specific requirements:

- Hold either a four-year honours degree from a Canadian university or a three-year university degree plus a Bachelor of Education degree or its equivalent from a recognized institution.
- Overall academic standing of at least a B (GPA: 3.0 on a 4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent.
- If applicable, a minimum score of 580 on the paper-based TOEFL, 92-93 on the Internet-based TOEFL or 7 on the IELTS. Note that these English language proficiency scores are slightly higher than those required for some other graduate programs at UOIT. Language requirements are specified in Section 3.4.4.

Please note that an admission interview may also be required.

6.6 Part-time studies

This program is particularly well suited for candidates holding part-time or full-time employment who wish to pursue studies in education at the graduate level on a part-time basis. Not only do all courses make use of web-based tools for information and communication in the usual manner, but students also meet with their colleagues and professors on a regular basis using a powerful and user-friendly videoconferencing system. All meetings are scheduled during weekday evening hours, except for the month of July (summer term) where an intensive weekday schedule is implemented. Since all meetings can be conducted online, students can complete the entire program from home, eliminating time and distance constraints.

6.7 Degree requirements

6.7.1 Master of Arts in Education

Students in the MA are required to take six 3-credit courses and complete a 12-credit thesis for a total of 30 credits.

EDUC 5001G Principles of Learning
EDUC 5002G Research Methods in Education
EDUC 5003G Advanced Research Methods and Design
6 credits from Cluster 1 in Section 6.8
12 credits from thesis
3 other course credits

6.7.2 Master of Education

The MEd program is available either with a portfolio option or a project option; however, all students will commence the program in the portfolio option. Students may request a transfer to the project option after the successful completion of the first four courses, which must include the two required courses (EDUC 5001G and EDUC 5002G). Students in the portfolio option are required to take ten 3-credit courses (one of which is the 3-credit digital portfolio). Students in the project option take eight courses together with a 6-credit research project. In both options, students take a total of 30 credits.

Portfolio option
EDUC 5001G Principles of Learning (required for all MEd students)
EDUC 5002G Research Methods in Education (required for all MEd students)
3 credits from other core courses
6 credits from Cluster 1 in Section 6.8
3 credits from EDUC 6300G MEd Graduate Portfolio
12 other course credits

Project option
EDUC 5001G Principles of Learning (required for all MEd students)
EDUC 5002G Research Methods in Education (required for all MEd students)
3 credits from other core courses (EDUC 5003G Advanced Research Methods is highly recommended)
6 credits from Cluster 1 in Section 6.8
6 credits from research project
9 other course credits

6.7.3 Graduate Diploma in Education and Digital Technologies

Students in the graduate diploma program must complete four courses in the field of Education and Digital Technologies for a total of 12 credits. The four courses must be completed within a three-year period with a minimum passing grade of B-minus in each course.

Courses may be selected from the following offerings:

EDUC 5101G Learning with Technology
EDUC 5102G Educational Technology and Communication
EDUC 5103G Online Technology in Education
EDUC 5104G Learning Tools
EDUC 5105G Technology Diffusion in Education
EDUC 5199G Special Topics in Education and Digital Technologies
EDUC 5205G Leadership and Technology
EDUC 5303G Technology and the Curriculum
EDUC 5304G Digital Literacy: Theory, Practice and Research
EDUC 5405G Digital Technologies in Adult Education

Students who have completed the graduate diploma program and wish to be considered for admission to the MEd can have up to six of the 12 credits counted toward the master's degree. Students who are currently enrolled in the graduate diploma program and wish to switch to the MEd may apply for admission. If an offer of admission is granted, they may transfer all of their credits from the diploma program to the master's degree. In this case, they would not receive the graduate diploma. Students who have completed UOIT's MA or MEd, or an equivalent program, and wish to enrol in the graduate diploma program may transfer up to six credits toward the diploma, depending on the courses they have taken in their master's program.

6.8 Course listing

Core courses

EDUC 5001G Principles of Learning (required for all MA and MEd students)
EDUC 5002G Research Methods in Education (required for all MA and MEd students)
EDUC 5003G Advanced Research Methods and Design (required for MA students)
EDUC 5004G The Reflective Practitioner
EDUC 5005G Social and Cultural Context of Education

Cluster 1 – Courses in the field of Education and Digital Technologies
EDUC 5101G Learning with Technology
EDUC 5102G Educational Technology and Communication
EDUC 5103G Online Technology in Education
EDUC 5104G Learning Tools
EDUC 5105G Technology Diffusion in Education
EDUC 5199G Special Topics in Education and Digital Technologies
EDUC 5205G Leadership and Technology
EDUC 5303G Technology and the Curriculum
EDUC 5304G Digital Literacy: Theory, Practice and Research
EDUC 5405G Digital Technologies in Adult Education

Cluster 2 – Leadership and administration courses
EDUC 5201G Foundations of Leadership
EDUC 5202G Organizational Theory, Culture and Decision Making
EDUC 5203G Dynamics of Change
EDUC 5204G Staff Development and Supervision
EDUC 5205G Leadership and Technology
EDUC 5206G Education Law and Governance
EDUC 5299G Special Topics in Leadership and Administration

Cluster 3 – Curriculum courses
EDUC 5301G Curriculum Theory
EDUC 5302G Curriculum Planning and Implementation
EDUC 5303G Technology and the Curriculum
EDUC 5304G Digital Literacy: Theory, Practice and Research
EDUC 5305G Authentic Assessment
EDUC 5399G Special Topics in Curriculum

Cluster 4 – Adult education courses
EDUC 5401G Introduction to Adult Education and Higher Education
EDUC 5402G The Adult Learner in a Digital Age
EDUC 5403G Adult Education: Contexts, Problems, and Issues
EDUC 5404G Teaching in an Adult Learning Environment
EDUC 5405G Digital Technologies in Adult Education

Other
EDUC 5501G Directed Studies

Completion options

EDUC 6100G MA Thesis – Part 1
EDUC 6101G MA Thesis – Part 2
EDUC 6102G MA Thesis – Part 3
EDUC 6103G MA Thesis – Part 4
EDUC 6201G MEd Graduate Research Project – Part 1
EDUC 6202G MEd Graduate Research Project – Part 2
EDUC 6300G MEd Graduate Portfolio

Section 7: Graduate Programs Offered by the Faculty of Energy Systems and Nuclear Science

7.1 Contact information

Faculty of Energy Systems and Nuclear Science
University of Ontario Institute of Technology (UOIT)
2000 Simcoe Street North
Oshawa, Ontario L1H 7K4
Canada

905.721.8668 ext. 5503
905.721.3046 (fax)
nuclear@uoit.ca
nuclear.uoit.ca

7.2 Graduate programs offered

The following graduate programs are offered by the Faculty of Energy Systems and Nuclear Science:

Nuclear Engineering

- Master of Applied Science (MASc)
- Master of Engineering (MEng) – regular program
- University Network of Excellence in Nuclear Engineering (UNENE) MEng program
- Doctor of Philosophy (PhD)

Graduate diplomas

- Graduate Diploma in Nuclear Design Engineering
- Graduate Diploma in Nuclear Technology – Fuel, Materials and Chemistry
- Graduate Diploma in Nuclear Technology – Health Physics
- Graduate Diploma in Nuclear Technology – Operation and Maintenance
- Graduate Diploma in Nuclear Technology – Radiological Applications
- Graduate Diploma in Nuclear Technology – Reactor Systems
- Graduate Diploma in Nuclear Technology – Safety, Licensing and Regulatory Affairs

7.2.1 Affiliated programs

The following graduate programs are affiliated with the Faculty of Energy Systems and Nuclear Science:

- Master of Engineering Management (offered in collaboration with the Faculty of Business and Information Technology and the Faculty of Engineering and Applied Science—see Section 8 for program information).
- Graduate Diploma in Engineering Management (offered in collaboration with the Faculty of Business and Information Technology and the Faculty of Engineering and Applied Science—see Section 8 for program information).

7.3 Graduate faculty

Dhavide Aruliah, BSc, MSc, PhD

Emma Bartfay, BSc, MMath, PhD

Wally Bartfay, RN, MN, PhD

Michael Bennett, BS, MA, PhD

George Bereznai, BE, MEng, PhD, PEng

Pietro-Luciano Buono, BSc, MSc, PhD

Ibrahim Dincer, BSc, MSc, PhD

John Froats, BEng, PEng

Hossam Gaber, BSc, PhD, PEng

Kamiel Gabriel, BSc, MSc, MBA, PhD, PEng

Mark Green, BSc, MSc, PhD

Julia Green-Johnson, BSc (Hons), MSc, PhD

Glenn Harvel, BEng, MEng, PhD, PEng

Douglas Holdway, BSc (Hons), MSc, PhD

Brian Ikeda, BSc (Hons), MSc, PhD

Holly Jones-Taggart, BSc (Hons), PhD

Matthew Kaye, BASc, MSc, PhD

Brent Lewis, BSc, MEng, PhD, PEng

Greg Lewis, BSc, MSc, PhD

Lixuan Lu, BESc, MESc, PhD, PEng

Rachid Machrafi, BSc, MSc, PhD

Jennifer McKellar, BASc, MASc, PhD, PEng

Eleodor Nichita, BSc, MSc, PhD, PEng

Scott Nokleby, BEng, MASc, PhD, PEng

Igor Pioro, MSc, PhD, Dr. Tech Sc., PEng

Jing Ren, BA, MSc, PhD

Marc Rosen, BASc, MASc, PhD, PEng, FCSME, FEIC, FASME, FIEF

Vijay Sood, BSc, MSc, PhD, FIEEE, FEIC

Anthony Waker, BSc, PhD

Edward Waller, BSc, MScE, PhD, PEng

7.4 Program information

The Nuclear Engineering graduate programs encompass the nuclear power industry, from fuel manufacture to radioactive waste disposal and the many and varied applications of radiation in industrial and medical disciplines with a strong emphasis on health physics. Typical workplace activities include fundamental and applied research, design and development of new equipment, systems and procedures, maintenance and modifications, commissioning and decommissioning of equipment and complete facilities, operation, analysis and regulatory affairs.

The master's programs in Nuclear Engineering are comprised of the following two fields:

- Nuclear Power
- Radiological and Health Physics

Graduates of a master's level degree program in Nuclear Engineering must be competent in a wide range of disciplines that impinge on the safe and reliable operation of the many and varied systems that comprise radiological equipment, nuclear power plants and related facilities. They must understand the complex

interrelationships between humans, non-human biota and the physical, chemical, economic and social components of the environment. The program provides the depth and breadth of knowledge necessary for practicing professionals in nuclear engineering. Under the guidance of a research supervisor and a multidisciplinary team of scientific and engineering faculty, each student has the opportunity to engage in in-depth study of particular problems that emphasize theory and/or experimentation.

An alternate to the regular program of study leading to the MEng in Nuclear Engineering is also available at UOIT. This program is administered by UNENE, a Canadian-based alliance of universities, nuclear power utilities, research and regulatory agencies for the support and development of nuclear education, research and development capability in Canadian universities. UNENE was created through the partnership of five Ontario universities including McMaster University, Queen's University, UOIT, University of Waterloo and Western University.

The UNENE MEng program was designed for the working professional, providing engineers the enhanced knowledge, tools, technology and business and management skills necessary to keep them at the forefront of their profession. Courses are offered on alternate weekends, usually over a seven-week period, versus the semester-based weekly delivery of lectures given typically in three-hour evening sessions. Courses can also be delivered using distance education tools to accommodate those students working at sites remote from the Greater Toronto Area. Additional details on the UNENE program are available at **unene.ca**.

The PhD program in Nuclear Engineering comprises the following two fields:

- Nuclear Power and Energy Applications
- Radiological and Health Physics

The main objective of the PhD program is to prepare graduates for a career that includes research and/or teaching in academia or industry; leadership positions that require problem solving skills with highly specialized knowledge, often in interdisciplinary fields; and the management of finances, projects and people. Graduates of the program are expected to be able to conduct independent research. Graduates of the program will be able to work in research labs in both industry and government or as academics in universities.

The seven graduate diplomas in Nuclear Design Engineering and Nuclear Technology are based on areas of specialization within the fields of Nuclear Power, and Radiological and Health Physics. The programs have been designed

to accommodate the needs of personnel working in the nuclear industry and to promote an orientation toward lifelong learning, as students may choose to complete a number of these diplomas over the course of their careers. Students in the graduate diploma programs will upgrade their knowledge and skills and position themselves for transfer and/or advancement within their industry.

Diplomas are offered in the areas of Fuel, Materials and Chemistry; Health Physics; Nuclear Design Engineering; Operation and Maintenance; Radiological Applications; Reactor Systems; and Safety, Licensing and Regulatory Affairs.

7.5 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, applicants must meet the following program-specific requirements.

Master of Applied Science and Master of Engineering in Nuclear Engineering

- Completion of a four-year honours undergraduate science or engineering degree from a Canadian university, or its equivalent from a recognized institution.
- Overall academic standing of at least a B (GPA: 3.0 on a 4.3 scale), with a minimum B in the last two years (four semesters) of full-time undergraduate work or equivalent, although a B+ is preferred for MASc applicants.

Close technical contact with a faculty member is an essential part of graduate education in engineering and science. Prior to being accepted into the MASc program, applicants must find a professor who specializes in their desired area of research and who is willing to act as a supervisor. In the event that the applicant cannot find a thesis supervisor, the applicant may be considered for admission into the MEng-Course option.

Master of Engineering in Nuclear Engineering – UNENE administered program

UNENE requires an honours or four-year degree in engineering, science or mathematics and a B average or better. UNENE also considers any relevant work or research history. Meeting the minimum requirements does not guarantee acceptance.

Individuals who choose to apply for admission to UOIT will, once their application is approved, be registered within the Faculty of Energy Systems and Nuclear

Science. The master's degree awarded by UOIT will be a MEng with a Nuclear Engineering designation.

Doctor of Philosophy in Nuclear Engineering

The minimum admission requirement for the PhD program is completion of a MASc-level degree in engineering from a Canadian university or its equivalent from a recognized institution.

Prior to being accepted into the program, PhD applicants must also find a professor who specializes in their desired area of research and who is willing to act as a supervisor.

Under exceptional circumstances, MASc students may transfer directly to the PhD program after completing one academic year in the MASc program if the following conditions are met:

1. Completion of a full master's program of course work (five courses worth a total of 15 credits) with at least an A average.
2. Strong evidence of research ability.
3. Approval of the direct transfer by the thesis supervisor(s) and the supervisory committee. The transfer must also be approved by the graduate program director and the dean of Graduate Studies. The faculty will usually require up to 12 additional credits of course work in the PhD program.

See Section 3.4.2.1 for additional information.

Graduate diplomas in Nuclear Design Engineering and Nuclear Technology

To be considered for admission into any of the graduate diploma programs, applicants must hold a bachelor's degree in the fields of engineering, science or mathematics with a grade point average of B-minus (GPA: 2.7 on a 4.3 scale). This is one grade below that for entry into a MEng degree program.

Individuals without an undergraduate degree and who have extensive experience relevant to the chosen field of diploma studies may be considered on a case-by-case basis. For more information, see Section 3.4.8 for UOIT's policy on non-standard applicants.

As graduate diploma program applicants are not required to prepare a thesis or major project, they are not required to find a supervisor. Their program advisor would be the graduate program director of the Faculty of Energy Systems and Nuclear Science.

7.6 Part-time studies

To facilitate access to all potential students, part-time studies are permitted. In particular, engineers in local industries may wish to pursue the MEng program or a graduate diploma program through part-time studies. The UNENE program is offered on a part-time basis only.

7.7 Degree requirements

7.7.1 Master of Applied Science in Nuclear Engineering

The objective of the MASc program is to prepare students for a career as engineers in fields that require specialized knowledge and skills. It is expected that graduates of the program will be able to work as engineers in industry, companies and government agencies with strong research and development programs or to continue their education by pursuing a PhD degree. The objective of the MASc program is achieved through a combination of course work, supervised research, a research seminar and a research thesis. Students must complete five courses for a total of 15 credits, a non-credit seminar course and a thesis worth 15 credits.

7.7.2 Master of Engineering in Nuclear Engineering

The objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills, including developing research skills. Graduates of the program will be able to use what they have learned in a variety of applications in industry, government and academia. All MEng students are required to engage in research activities as part of projects in many of the courses.

The MEng degree program has three options:

- MEng-Course, which consists of only courses.
- MEng-Graduate Research Project, which consists of a combination of courses and a project.
- MEng-Industrial Research Project, which consists of a combination of courses and a project.

For the MEng-Course option, students must complete 10 courses worth a total of 30 credits.

For the MEng-Graduate Research Project option, students must complete seven courses worth a total of 21 credits and a graduate research project worth nine credits. Under the supervision of a faculty member, students have the opportunity

to integrate and synthesize knowledge gained throughout their program of study. The chosen topic is dependent on the area of specialization of the student, using resources normally available on campus. Students are required to write a report and give a presentation on their completed project.

Students in the MEng-Industrial Research Project option must complete eight courses (24 credits) and an industrial project worth six credits. Students enrolled part-time in this program option may designate a period of approximately four months in an industrial laboratory to carry out an industry-oriented project under the supervision of a suitably qualified staff engineer or scientist, as well as a university co-supervisor. The faculty works with the students and their employers to arrange suitable projects. A satisfactory project topic and appropriate arrangements are required for the project to be approved by the faculty. However, in some cases, it is possible that this may not be feasible. Upon completion, students are expected to submit a substantial report and conduct a presentation about the project at the university. The industrial research project can only be undertaken after at least half the required courses have been completed.

Students in the MASc or MEng programs may take no more than one third of their courses from the undergraduate courses listed in Section 7.8 or other 4000-level courses specifically approved by the graduate program director, provided the students did not take similar courses during their undergraduate degree programs.

Students must take at least half of their graduate courses from the list of NUCL 5000-level graduate courses in Section 7.8. Courses not listed and offered by other faculties at UOIT or other universities can only be taken for credit if first approved by the graduate program director.

Courses are offered on the basis of demand with the expectation that courses will be offered at a minimum of once every two years.

7.7.3 Master of Engineering in Nuclear Engineering – UNENE administered program

Students in the UNENE program must complete 10 UNENE courses or eight courses and an industrial project. Three of the courses can be business courses from the Advanced Design and Manufacturing Institute (ADMI). The project is normally co-sponsored by the student’s employer and one of the universities. Students have a maximum of five years to complete the required number of courses.

7.7.4 Doctor of Philosophy in Nuclear Engineering

Students in the PhD program must complete four courses worth a total of 12 credits and a dissertation worth 40 credits (NUCL 6001G PhD Thesis). In general, the PhD dissertation involves intensive research and requires determination and enthusiasm to deliver a new contribution to the field of study. The duration of the PhD program is normally three to four years and financial support for the student must be secured.

In addition to the four courses and dissertation, the student must successfully complete NUCL 6002G Workshop and Professional Development and NUCL 6003G Doctoral Seminar. These are graded on a pass/ fail basis. Courses in other graduate programs at UOIT may be taken provided students have not taken similar courses during their undergraduate or master's degrees and the courses are approved by the graduate program director.

Students who transfer directly from a MASc program into the PhD program must complete nine courses worth a total of 27 credits and a dissertation worth 40 credits (NUCL 6001G PhD Thesis). In addition to the nine courses, the students must successfully complete NUCL 6002G Workshop and Professional Development and NUCL 6003G Doctoral Seminar.

Within 18 months of entry into the PhD program, students must prepare a written research proposal and pass an oral candidacy exam. PhD students must also successfully defend their dissertation in front of an examining committee.

7.7.5 Graduate diplomas in Nuclear Design Engineering and Nuclear Technology

To earn a graduate diploma, students are required to complete four courses approved by the graduate program director that are relevant to one of the areas of specialization. Each diploma has a set of defined courses relevant to the area of specialization and potentially some non-specialist courses. The four courses must be completed within a three-year period with a minimum passing grade of B-minus for each course.

Transfer credit for a course that has been taken at UOIT, or for a similar course taken at another institution within the last three years, may be granted by the Faculty of Energy Systems and Nuclear Science graduate program director as long as the mark received in the course for which transfer credit is requested was a B or higher. In addition, the course must not have been used to meet the degree or diploma requirements in another program either at UOIT or at another post-secondary institution. See Section 3.4.3 for additional information.

The student must select the specific diploma he or she wishes to obtain at the time of registration. Any changes to this choice, and to the selection of courses which are designed to achieve the intent of the specific specialty, must be approved by the graduate program director. It should be noted that any one course can only be counted towards one diploma and that transfer credits between other graduate diploma programs are not permitted.

For the Graduate Diploma in Nuclear Design Engineering, one elective graduate course may be substituted for one of the three graduate-level courses, or a senior 4000-level undergraduate course may be substituted for ENGR 4520, subject to the approval of the graduate program director.

As part of the requirements for the graduate diplomas in Nuclear Technology, students must complete the following:

- A minimum of two courses from the specialty, including at least one NUCL course.
- No more than one course from another specialty and/or up to two courses from the non-specialist common courses.
- A minimum of two NUCL courses at the 5000 level.

Subject to the approval of the graduate program director, one graduate course may be taken that is not listed for the graduate diplomas in Nuclear Technology (i.e., from a graduate program offered by other UOIT faculties).

Of the four required courses for each graduate diploma, no more than one may be selected from the specified undergraduate course options.

Students who complete any of the graduate diplomas and wish to be considered for admission to the MASc or the MEng in Nuclear Engineering may have up to six of the 12 credits counted toward their master's degree. Students who are enrolled in the graduate diploma program and wish to switch to the MASc or MEng in Nuclear Engineering may apply for admission. If an offer of admission is granted, they may be able to transfer all of their credits from the diploma program to the master's degree. In this case, they would not receive the graduate diploma. Students who have completed UOIT's MASc or MEng in Nuclear Engineering, or an equivalent program, and who wish to enrol in the graduate diploma program may transfer up to six credits toward the diploma depending on the courses they have taken in their master's program.

Graduate Diploma in Nuclear Design Engineering

ENGR 4520 Nuclear Plant Safety Design
NUCL 5100G Nuclear Plant Systems and Operation

NUCL 5120G Design of Nuclear Plant Systems
NUCL 5130G Nuclear Design Processes and Techniques

Diplomas in the field of Nuclear Power

1. Fuel, Materials and Chemistry

NUCL 5080G Advanced Topics in Environmental Degradation of Materials
NUCL 5220G Fuel Management in Nuclear Reactors
NUCL 5300G Advanced Topics in Radioactive Waste Management
NUCL 5450G Advanced Material Analysis
ENGR 4510 Nuclear Plant Chemistry
ENGR 4610 Corrosion for Engineers
ENGR 4620 Radioactive Waste Management Design
ENGR 4680 Nuclear Materials
ENGR 4810 Nuclear Fuel Cycles

2. Operation and Maintenance

NUCL 5100G Nuclear Plant Systems and Operation
NUCL 5250G Power Plant Thermodynamics
NUCL 5270G Control, Instrumentation and Electrical Systems in CANDU Based Nuclear Power Plants
NUCL 5280G Advanced Reactor Control
ENGR 5121G Advanced Turbo Machinery
ENGR 5740G User Interface Design
ENGR 5910G Embedded Real-Time Control Systems
ENGR 5920G Analysis and Control of Nonlinear Systems
ENGR 5930G Adaptive Control
ENGR 5940G Intelligent Control Systems
ENGR 5960G Power System Operations, Analysis and Planning
ENGR 4670 Shielding Design

3. Reactor Systems

NUCL 5200G Reactor Physics
NUCL 5210G Advanced Reactor Physics
NUCL 5215G Advanced Reactor Engineering
NUCL 5230G Advanced Nuclear Thermalhydraulics
NUCL 5240G Heat Transfer in Nuclear Reactor Applications
NUCL 5290G Advances in Nuclear Power Plant Systems
ENGR 5122G Computational Fluid Dynamics
ENGR 4700 Nuclear Plant Design and Simulation

ENGR 4730 Reactor Control
ENGR 4780 Nuclear Reactor Design

4. Safety, Licensing and Regulatory Affairs
NUCL 5050G Applied Risk Analysis
NUCL 5070G Environmental Modelling
NUCL 5090G Occupational Health and Safety
NUCL 5260G Reactor Containment Systems
NUCL 5430G Advanced Dosimetry
NUCL 5440G Advanced Radiation Biophysics and Microdosimetry
ENGR 4520 Nuclear Plant Safety Design
ENGR 4660 Risk Analysis Methods
RADI 4220 Radiation Biophysics and Dosimetry
RADI 4550 Radiation Detection and Measurement

Diplomas in the field of Radiological and Health Physics

1. Health Physics
NUCL 5070G Environmental Modelling
NUCL 5090G Occupational Health and Safety
NUCL 5300G Advanced Topics in Radioactive Waste Management
NUCL 5430G Advanced Dosimetry
NUCL 5440G Advanced Radiation Biophysics and Microdosimetry
ENGR 4620 Radioactive Waste Management Design
ENGR 4670 Shielding Design
RADI 4220 Radiation Biophysics and Dosimetry
RADI 4550 Radiation Detection and Measurement

2. Radiological Applications
NUCL 5400G Advanced Radiation Science
NUCL 5410G Physics of Radiation Therapy (cross-listed with RADI 4320)
NUCL 5460G Industrial Radiography
NUCL 5470G Nuclear Forensic Analysis
RADI 4430 Industrial Applications of Radiation Techniques
RADI 4440 Radioisotopes and Radiation Machines

Non-specialist courses common to all diploma programs
NUCL 5010G Project Management for Nuclear Engineers
NUCL 5020G Mathematical Methods in Nuclear Applications
NUCL 5030G Transport Theory
NUCL 5040G Monte Carlo Methods (cross-listed with MCSC 6165G)

NUCL 5060G Nuclear Concepts for Engineers and Scientists
NUCL 5065G Thermalhydraulics Concepts for Engineers and Scientists
NUCL 5275G Safety Instrumented Systems (SIS)
NUCL 5285G Advanced Process Control Systems
NUCL 5420G Aerosol Mechanics
ENGR 5010G Advanced Optimization
MCSC 6120G Numerical Methods for Ordinary Differential Equations
MCSC 6210G Advanced Topics in Mathematical Modelling
MCSC 6230G Advanced Topics in High-Performance Computing

7.8 Course listing

Core graduate courses offered by the Faculty of Energy Systems and Nuclear Science

NUCL 5001G MASc Thesis
NUCL 5003G Seminar
NUCL 5004G Directed Studies
NUCL 5005G Special Topics
NUCL 5006G Industrial Research Project
NUCL 5009G Graduate Research Project
NUCL 5010G Project Management for Nuclear Engineers
NUCL 5020G Mathematical Methods in Nuclear Applications
NUCL 5030G Transport Theory
NUCL 5040G Monte Carlo Methods (cross-listed with MCSC 6165G)
NUCL 5050G Applied Risk Analysis
NUCL 5060G Nuclear Concepts for Engineers and Scientists
NUCL 5065G Thermalhydraulics Concepts for Engineers and Scientists
NUCL 5070G Environmental Modelling
NUCL 5080G Advanced Topics in Environmental Degradation of Materials
NUCL 5090G Occupational Health and Safety
NUCL 5100G Nuclear Plant Systems and Operation
NUCL 5120G Design of Nuclear Plant Systems
NUCL 5130G Nuclear Design Processes and Techniques
NUCL 5200G Reactor Physics
NUCL 5210G Advanced Reactor Physics
NUCL 5215G Advanced Reactor Engineering
NUCL 5220G Fuel Management in Nuclear Reactors
NUCL 5230G Advanced Nuclear Thermalhydraulics
NUCL 5240G Heat Transfer in Nuclear Reactor Applications

NUCL 5250G Power Plant Thermodynamics
NUCL 5260G Reactor Containment Systems
NUCL 5270G Control, Instrumentation and Electrical Systems in CANDU Based Nuclear Power Plants
NUCL 5275G Safety Instrumented Systems (SIS)
NUCL 5280G Advanced Reactor Control
NUCL 5285G Advanced Process Control Systems
NUCL 5290G Advances in Nuclear Power Plant Systems
NUCL 5300G Advanced Topics in Radioactive Waste Management
NUCL 5310G Transmutation of Nuclear Waste
NUCL 5350G Regulatory Affairs and Licensing Concepts
NUCL 5400G Advanced Radiation Science
NUCL 5410G Physics of Radiation Therapy
NUCL 5420G Aerosol Mechanics
NUCL 5430G Advanced Dosimetry
NUCL 5440G Advanced Radiation Biophysics and Microdosimetry
NUCL 5450G Advanced Material Analysis
NUCL 5460G Industrial Radiography
NUCL 5470G Nuclear Forensic Analysis
NUCL 6000G PhD Candidacy Exam
NUCL 6001G PhD Thesis
NUCL 6002G Workshop and Professional Development
NUCL 6003G Doctoral Seminar
NUCL 6004G Directed Studies for Doctoral Candidates
NUCL 6005G Special Topics for Doctoral Candidates

Elective graduate courses from the Faculty of Engineering and Applied Science

ENGR 5010G Advanced Optimization
ENGR 5121G Advanced Turbo Machinery
ENGR 5122G Computational Fluid Dynamics
ENGR 5740G User Interface Design
ENGR 5750G Software Quality Management
ENGR 5910G Embedded Real-Time Control Systems
ENGR 5920G Analysis and Control of Nonlinear Systems
ENGR 5930G Adaptive Control
ENGR 5940G Intelligent Control Systems
ENGR 5960G Power System Operations, Analysis and Planning

Elective graduate courses from the Faculty of Science

MCSC 6010G Mathematical Modelling
MCSC 6030G High-Performance Computing
MCSC 6120G Numerical Methods for Ordinary Differential Equations
MCSC 6125G Numerical Methods for Partial Differential Equations

UNENE courses

UN 0500 Engineering Project, UOIT
UN 0501 Fuel Management
UN 0502 Nuclear Power Plant Systems and Operations
UN 0600 Engineering Project, Western University
UN 0601 Control, Instrumentation and Electrical Systems in CANDU based Nuclear Power Plants
UN 0602 Nuclear Fuel Waste Management
UN 0603 Project Management for Nuclear Engineers
UN 0700 Engineering Project, University of Waterloo
UN 0701 Engineering Risk and Reliability
UN 0800 Engineering Project, McMaster University
UN 0802 Nuclear Reactor Physics
UN 0803 Nuclear Reactor Safety Design
UN 0804 Nuclear Reactor Heat Transport System Design
UN 0805 Introduction to Operational Health Physics
UN 0806 Nuclear Fuel Engineering
UN 0807 Power Plant Thermodynamics
UN 0808 Reactor Chemistry and Corrosion
UN 0900 Engineering Project, Queen's University
UN 0901 Nuclear Materials

Undergraduate Nuclear Engineering courses available for credit towards a graduate program in the Faculty of Energy Systems and Nuclear Science

ENGR 4510 Nuclear Plant Chemistry
ENGR 4520 Nuclear Plant Safety Design
ENGR 4610 Corrosion for Engineers
ENGR 4620 Radioactive Waste Management Design
ENGR 4640 Nuclear Plant Operations
ENGR 4660 Risk Analysis Methods
ENGR 4670 Shielding Design
ENGR 4680 Nuclear Materials
ENGR 4700 Nuclear Plant Design and Simulation

ENGR 4730 Reactor Control
ENGR 4780 Nuclear Reactor Design
ENGR 4810 Nuclear Fuel Cycles
ENGR 4880 Principles of Fusion Energy

Undergraduate Health Physics and Radiation Science courses available for credit towards a graduate program in the Faculty of Energy Systems and Nuclear Science

RADI 4220 Radiation Biophysics and Dosimetry
RADI 4430 Industrial Applications of Radiation Techniques
RADI 4440 Radioisotopes and Radiation Machines
RADI 4550 Radiation Detection and Measurement

Note: Course descriptions for the undergraduate courses listed above can be found in the 2014-2015 Undergraduate Academic Calendar and Course Catalogue located on the UOIT website at **uoit.ca**.

Section 8: Graduate Programs Offered by the Faculty of Engineering and Applied Science

8.1 Contact information

Faculty of Engineering and Applied Science
University of Ontario Institute of Technology (UOIT)
2000 Simcoe Street North
Oshawa, Ontario L1H 7K4
Canada

905.721.3268
905.721.3370 (fax)
engineering@uoit.ca
engineering.uoit.ca

8.2 Graduate programs offered

The following graduate programs are offered by the Faculty of Engineering and Applied Science:

Automotive Engineering

- Master of Applied Science (MASc)
- Master of Engineering (MEng)

Electrical and Computer Engineering

- MASc
- MEng
- Doctor of Philosophy (PhD)

Engineering Management (offered in collaboration with the Faculty of Business and Information Technology and the Faculty of Energy Systems and Nuclear Science)

- Master of Engineering Management (MEngM)
- Graduate Diploma in Engineering Management

Mechanical Engineering

- MASc
- MEng
- PhD

8.2.1 Affiliated programs

The following graduate programs are affiliated with the Faculty of Engineering and Applied Science:

- Master of Science in Computer Science (offered in collaboration with the Faculty of Business and Information Technology and the Faculty of Science—see Section 10 for program information).
- PhD in Computer Science (offered in collaboration with the Faculty of Business and Information Technology and the Faculty of Science—see Section 10 for program information).

8.3 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, applicants must meet the following program-specific requirements.

8.3.1 Master of Applied Science and Master of Engineering programs

- Completion of an undergraduate engineering degree in a relevant field from an accredited engineering program at a Canadian university, or its equivalent from a recognized institution.
- Overall academic standing of at least a B (GPA: 3.0 on a 4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent. B+ is preferred for MASc applicants.

Applicants must possess maturity and self-motivation. Close technical contact with a faculty member is an essential part of graduate education in engineering. Prior to being accepted into the program, MASc applicants must find a professor who specializes in their desired area of research and who is willing to act as a supervisor. MEng applicants who select the MEng-Project option must also find a professor who is willing to act as a project supervisor. In the event the MEng-Project applicant cannot find a project supervisor, the applicant may be considered for admission into the MEng-Course option.

8.3.2 Master of Engineering Management and Graduate Diploma in Engineering Management

- Completion of an undergraduate engineering degree in a relevant field from an accredited engineering program at a Canadian university, or its equivalent from a recognized institution.
- Overall academic standing of at least a B (GPA: 3.0 on a 4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent.

8.3.3 Doctor of Philosophy programs

The minimum admission requirement for the PhD program is completion of a MASc-level degree in engineering at a Canadian university or its equivalent.

Under exceptional circumstances, MASc students may transfer directly to the PhD program after completing one academic year in the MASc program if the following conditions are met:

1. They complete a full master's program of course work (five graduate courses worth a total of 15 credits) with at least an A average.
2. They show strong evidence of research ability.
3. The research supervisor(s) and supervisory committee approve the direct transfer. The transfer must also be approved by the graduate program director and the dean of Graduate Studies. Normally, the faculty will require up to 12 additional credits of course work in the PhD program.

See Section 3.4.2.1 for additional information.

8.4 Part-time studies

To facilitate access to all potential students, part-time studies are permitted. Engineers in local industries and government agencies, for example, may wish to access the MEng, MEngM or Graduate Diploma in Engineering Management programs through part-time studies.

8.5 General degree requirements

8.5.1 Master of Applied Science, Master of Engineering and Doctor of Philosophy

The MASc programs involve a combination of courses and a thesis. These programs are research oriented and they provide excellent preparation for a career in research, development, advanced engineering and/or teaching.

The MEng programs are professional master's programs for upgrading and expanding technical skills and knowledge. They emphasize course-based learning, sometimes accompanied by a major project.

The MEng degree programs have two options:

- MEng-Project, which consists of a combination of courses and a project.
- MEng-Course, which consists of only courses.

The PhD program includes a combination of courses and a dissertation. The PhD dissertation involves intensive research to develop major new scholarly contributions to the field of study. The duration of the PhD program is normally three to four years. Financial support for the student must be secured.

In addition to the required graduate courses, MASc and MEng-Project students may take only one senior year undergraduate engineering course (i.e., with prefix ENGR 4xxxU) in lieu of a graduate-level course, provided they have not already taken a similar course during their undergraduate degree and the course is approved by both the student's supervisor and the graduate program director. MEng-Course students may take up to two senior year engineering or applied science undergraduate courses in lieu of up to two graduate-level courses; again, provided they have not taken similar courses during their undergraduate degree and the courses are approved by the graduate program director. PhD students may not take any undergraduate-level courses in lieu of their graduate course requirements.

Courses in other graduate programs at UOIT may be taken provided that students have not taken similar courses during their undergraduate or master's degrees and the courses are approved by the graduate program director. At least half of a student's courses must be within their program in the Faculty of Engineering and Applied Science. Students who wish to take courses outside of their program must gain approval from the graduate program director. Students who are uncertain about the academic background needed for a graduate course should consult the course instructor before registering for the course.

Specific graduate course requirements for the MASc, MEng and PhD degrees are listed individually in sections 8.6 (Automotive Engineering), 8.7 (Electrical and Computer Engineering) and 8.9 (Mechanical Engineering).

8.5.2 Master of Engineering Management and Graduate Diploma in Engineering Management

The MEngM degree program has two options:

- MEngM-Project, which consists of a combination of courses and a project.
- MEngM-Course, which consists of only courses.

The graduate diploma program consists of only courses.

MEngM students may take one senior fourth-year undergraduate course within the Faculty of Engineering and Applied Science or the Faculty of Energy Systems and Nuclear Science in lieu of an engineering elective course, provided they have not already taken a similar course during their undergraduate degree and the course is approved by the graduate program director. For MEngM-Project students, a maximum of two courses (or three courses for MEngM-Course students) may be taken outside of the program of study, at or external to UOIT, subject to approval by the graduate program director.

Graduate diploma students are not permitted to take courses outside of their program of study for program credit. In addition, they may not take any senior fourth-year undergraduate courses from the Faculty of Engineering and Applied Science or the Faculty of Energy Systems and Nuclear Science in lieu of a graduate course.

Specific graduate course requirements for the MEngM and Graduate Diploma in Engineering Management are listed in Section 8.8.

8.6 Automotive Engineering

8.6.1 Graduate faculty

Martin Agelin-Chaab, BSc, MEng, MSc, PhD, PEng

Ahmad Barari, BSc, MSc, PhD, PEng

Ibrahim Dincer, BSc, MSc, PhD, PEng, FCSME, FEIC, FWIF

Mikael Eklund, BSc, MSc, PhD, PEng

Moustafa El-Gindy, BSc, MSc, PhD, FASME

Ebrahim Esmailzadeh, BSc, MPhil, PhD, PEng, CEng, FCSME, FEIC, FASME, FIMechE, SMIEEE

Kamiel Gabriel, BSc, MSc, MBA, PhD, PEng

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Hossam Kishawy, BSc, MSc, PhD, PEng, FASME

Ramiro Liscano, BScEng, MScEng, PhD, PEng, SMIEEE

Atef Mohany, BSc, MSc, PhD, PEng

Scott Nokleby, BEng, MASc, PhD, PEng

Remon Pop-Iliev, BSc, MASc, PhD, PEng

Jing Ren, BA, MSc, PhD

Ghaus Rizvi, ME, MS, MASc, PhD, PEng

Greg Rohrauer, DEC, BEng, PhD, PEng

Marc Rosen, BASc, MASc, PhD, PEng, FCSME, FEIC, FASME, FIEF, FCAE

Vijay Sood, BSc, MSc, PhD, FIEEE, FEIC

Dan Zhang, BASc, MASc, PhD, PEng, FCSME

8.6.2 Program information

The MASc and MEng programs in Automotive Engineering provide students with a detailed understanding of advanced technologies and processes related to automotive systems. These programs allow students to study all of the main areas associated with automotive systems. These areas include scientific principles, analysis techniques and design methodologies. The programs are also designed to provide students with the broad and advanced education necessary for productive careers in the public or private sectors, as well as in academia. Students develop skills necessary for clear communication and responsible teamwork and to inspire professional attitudes and ethics. This prepares them for modern work environments and lifelong learning.

Students with undergraduate degrees in mechanical engineering, electrical engineering, or other fields of engineering or science may apply to the Automotive Engineering graduate programs. The multidisciplinary nature of automotive systems, ranging from manufacturing and powertrains to electrical power/control systems and others, provides opportunities for students to gain broad exposure to various disciplines at an advanced graduate level.

8.6.3 Degree requirements

8.6.3.1 Master of Applied Science in Automotive Engineering

The main objective of the MASc program in Automotive Engineering is to prepare students for careers in research, development and advanced engineering. Graduates of the program can work as engineers in research and development in the automotive sector, companies focused in advanced technology, government agencies or other areas. They are also well prepared to continue their education and pursue a PhD degree. The objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar and a research thesis.

General MASc degree requirements are stipulated in Section 8.5.1. In addition, a student must complete five courses for a total of 15 credits and a thesis worth 15 credits for the MASc program in Automotive Engineering. The course ENGR 5300G Automotive Engineering is a required course for all Automotive Engineering graduate students. It gives an advanced overview of the automobile as an integrated system.

Students must also select at least two additional courses from the group of ENGR 53xxG courses (focusing on automotive engineering), plus remaining electives from the concentration areas of 50xxG, 51xxG, 52xxG, 56xxG, 57xxG, 58xxG and/or 59xxG courses. In addition to these five graduate courses, students must successfully complete ENGR 5003G MASc Seminar and ENGR 5001G MASc Thesis.

8.6.3.2 Master of Engineering in Automotive Engineering

The main objective of the MEng program in Automotive Engineering is to provide the opportunity for engineers in industry to upgrade and expand their skills. Graduates of the program will be able to apply their education to various advanced technologies and processes in the automotive sector and other industries. Depending on which option the student selects, the objective of the MEng program can be achieved through either a combination of course work and a project or solely course work. MEng students have exposure to research through projects included in most of the graduate courses.

General MEng degree requirements are stipulated in Section 8.5.1. In addition, students who select the MEng-Project option must complete seven courses for a total of 21 credits and a project worth nine credits (ENGR 5002G MEng/MEngM Project). This includes the required course ENGR 5300G Automotive Engineering, at least three other courses from the ENGR 53xxG group and remaining courses from the electives. For the MEng-Course option, students

must complete 10 courses worth a total of 30 credits. In this option, students are required to take ENGR 5300G Automotive Engineering, at least three other courses from the ENGR 53xxG group and the remaining courses from the electives.

The core area of automotive systems (ENGR 53xxG) focuses on courses specifically aimed at engineering systems for automobiles rather than general applications to other mechanical, electrical and non-automotive systems. It is beneficial for students to take some of the remaining electives from the same concentration area; however, it is not required as it is also valuable for students to receive breadth of knowledge at the graduate level.

8.6.4 Course listing

Courses offered in the MASc and MEng programs are subdivided into an automotive core area (ENGR 53xxG) and specific concentration areas of energy and thermofluids (ENGR 51xxG), mechatronics and manufacturing (ENGR 52xxG), communications and signal processing (ENGR 56xxG), software (ENGR 57xxG) and electronics and control systems (ENGR 58xxG, ENGR 59xxG).

The following list shows all courses relevant to the Automotive Engineering graduate programs:

ENGR 5001G MASc Thesis
ENGR 5002G MEng/MEngM Project
ENGR 5003G MASc Seminar
ENGR 5004G MASc/MEng Directed Studies
ENGR 5005G Special Topics
ENGR 5010G Advanced Optimization
ENGR 5011G Advanced Engineering Design
ENGR 5012G Advanced and Smart Materials
ENGR 5013G Advanced Engineering Mathematics
ENGR 5015G Advanced Computer Aided Geometric Design

i) Concentration area – Energy and thermofluids

ENGR 5100G Advanced Energy Systems
ENGR 5101G Thermal Energy Storage
ENGR 5102G Fuel Cells and Hydrogen Systems
ENGR 5120G Advanced Fluid Mechanics
ENGR 5121G Advanced Turbo Machinery
ENGR 5122G Computational Fluid Dynamics
ENGR 5140G Advanced Heat Transfer
ENGR 5141G Heat Exchanger Design and Analysis
ENGR 5160G Advanced Thermodynamics
ENGR 5161G HVAC and Refrigeration Systems Design and Analysis

ii) Concentration area – Mechatronics and manufacturing

ENGR 5221G Computer-Integrated Manufacturing
ENGR 5222G Polymers and Composite Processing
ENGR 5223G Advanced Manufacturing Processes and Methodologies
ENGR 5240G Advanced Dynamics
ENGR 5241G Advanced Mechanics of Materials
ENGR 5242G Advanced Vibrations
ENGR 5243G Mechanics and Dynamics of Machine Tools
ENGR 5244G Advanced Acoustics and Noise Control
ENGR 5260G Advanced Robotics and Automation
ENGR 5261G Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5263G Advanced Control

iii) Core area – Automotive systems

ENGR 5300G Automotive Engineering
ENGR 5310G Advanced Vehicle Dynamics
ENGR 5320G Automotive Aerodynamics
ENGR 5330G Automotive Powertrains
ENGR 5340G Automotive Noise, Vibrations and Harshness
ENGR 5350G Automotive Materials and Manufacturing
ENGR 5360G Automotive Electronics and Software
ENGR 5370G Automotive Design Engineering

iv) Concentration area – Communications and signal processing

ENGR 5610G Stochastic Processes
ENGR 5620G Digital Communications
ENGR 5630G Statistical Signal Processing
ENGR 5640G Advanced Wireless Communications
ENGR 5650G Adaptive Systems and Applications
ENGR 5670G Cryptography and Secure Communications (cross-listed with CSCI 5310G and MITS 5500G)

v) Concentration area – Software

ENGR 5720G Pervasive and Mobile Computing (cross-listed with CSCI 5350G)
ENGR 5750G Software Quality Management
ENGR 5760G Software Metrics

vi) Concentration area – Electronics and control systems

ENGR 5850G Analog Integrated Circuit Design
ENGR 5860G Digital Integrated Circuit Design
ENGR 5910G Embedded Real-Time Control Systems
ENGR 5920G Analysis and Control of Nonlinear Systems
ENGR 5930G Adaptive Control
ENGR 5940G Intelligent Control Systems
ENGR 5970G Advanced Power Electronics

A graduate course in one of the approved concentration areas for automotive engineering may be substituted for ENGR 53xxG, subject to the approval of the graduate program director. MASc/MEng students may replace ENGR 5310G Advanced Vehicle Dynamics by ENGR 5240G Advanced Dynamics or replace ENGR 5340G Automotive Noise, Vibrations and Harshness by ENGR 5242G Advanced Vibrations, subject to the approval of the course instructor. The mechanical-focused project topic in ENGR 5240G/5242G is replaced by an automotive-focused project in ENGR 5310G/5340G, respectively.

8.7 Electrical and Computer Engineering

8.7.1 Graduate faculty

Michael Bennett, BS, MA, PhD, PEng

George Bereznai, BE, MEng, PhD, PEng

Jeremy Bradbury, BSc, MSc, PhD

Ibrahim Dincer, BSc, MSc, PhD, PEng, FCSME, FWIF

Min Dong, BEng, PhD

Mikael Eklund, BSc, MSc, PhD, PEng

Khalil El-Khatib, BS, MS, PhD

Ebrahim Esmailzadeh, BSc, MPhil, PhD, PEng, CEng, FCSME, FEIC, FASME, FIMechE, SMIEEE

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Ruth Milman, BASc, MASc, PhD

Walid Morsi, BSc, MSc, PhD

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Ying Wang, BEng, MASc, PhD

Mohamed Youssef, BSc, MSc, PhD

Dan Zhang, BASc, MASc, PhD, PEng, FCSM

Ying Zhu, BSc, MSc, PhD

* Master's program

8.7.2 Program information

The MASc and MEng programs in Electrical and Computer Engineering allow a student to study in all major areas associated with electrical, computer and software systems engineering. These areas include electronics, intelligent systems, communications, control, biomedical, power electronics, power generation, software engineering, mobile systems and embedded software systems. These disciplines are expected to be in high demand by employers.

In addition, students in the PhD program can specialize in one of the following three fields:

- Communications and Signal Processing
- Control Systems
- Software Systems

Alternatively, a student can choose to cover many facets of the broad discipline of electrical, computer and software engineering. Topics can vary widely and may include communications, networking, intelligent control systems, robotics,

computer vision, health informatics, mobile systems, power systems and smart power grids.

8.7.3 Degree requirements

8.7.3.1 Master of Applied Science in Electrical and Computer Engineering

The objective of the MASc program in Electrical and Computer Engineering is to prepare students for careers in research, development and advanced engineering in disciplines involving electrical and computer engineering. Graduates of the program will be able to work as engineers in research and development or other areas in advanced technology companies or government agencies, or to continue their education and pursue a PhD degree. The objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar and a research thesis.

General MASc degree requirements are stipulated in Section 8.5.1. For the MASc in Electrical and Computer Engineering, students must complete five courses for a total of 15 credits and a thesis worth 15 credits. Students must also successfully complete ENGR 5003G MASc Seminar and ENGR 5001G MASc Thesis.

8.7.3.2 Master of Engineering in Electrical and Computer Engineering

The objective of the MEng program in Electrical and Computer Engineering is to provide the opportunity for engineers in industry to upgrade and expand their skills, including research skills. Graduates of the program will be able to apply what they have learned in a variety of applications in industry, government and academia. Depending on which option the student selects, the objective of the MEng program can be achieved through either a combination of course work and a project or solely course work. MEng students have exposure to research through projects included in most of the graduate courses.

General MEng degree requirements are stipulated in Section 8.5.1. For the MEng-Project option, students must complete seven courses worth a total of 21 credits and a project worth nine credits (ENGR 5002G MEng/MEngM Project). For the MEng-Course option, students must complete 10 courses worth a total of 30 credits.

8.7.3.3 Doctor of Philosophy in Electrical and Computer Engineering

Students in the PhD program must complete four courses worth a total of 12 credits, the PhD Candidacy Exam (ENGR 6001G), Seminar I (ENGR 6003G),

Seminar II (ENGR 6013G), Workshops (ENGR 6006G) and a dissertation worth 40 credits (ENGR 6002G).

A student who transfers directly into the PhD program after one full year in the MASc program must complete nine courses worth a total of 27 credits, Seminar I (ENGR 6003G), Seminar II (ENGR 6013G), Workshops (ENGR 6006G) and a dissertation worth 40 credits (ENGR 6002G).

Within 18 months of entry into the PhD program, PhD students must prepare a written research proposal and pass the oral PhD candidacy exam (ENGR 6001G). PhD students must successfully defend their dissertation (ENGR 6002G) in front of an examining committee.

8.7.4 Course listing

Graduate courses offered are listed below. Courses related to communications and signal processing are numbered as ENGR 56xxG. Courses related to software and computer systems are numbered as ENGR 57xxG. Courses related to electronics and mechatronics are numbered as ENGR 58xxG. Courses related to control systems and power systems are numbered as ENGR 59xxG.

ENGR 5001G MASc Thesis
ENGR 5002G MEng/MEngM Project
ENGR 5003G MASc Seminar
ENGR 5004G MASc/MEng Directed Studies
ENGR 5005G Special Topics
ENGR 5010G Advanced Optimization
ENGR 5013G Advanced Engineering Mathematics
ENGR 5263G Advanced Control
ENGR 5605G Convex Optimization
ENGR 5610G Stochastic Processes
ENGR 5620G Digital Communications
ENGR 5630G Statistical Signal Processing
ENGR 5631G Advanced Estimation Theory
ENGR 5632G Advanced Detection Theory
ENGR 5640G Advanced Wireless Communications
ENGR 5650G Adaptive Systems and Applications
ENGR 5660G Communication Networks (cross-listed with CSCI 5300G and MITS 5200G)
ENGR 5670G Cryptography and Secure Communications (cross-listed with CSCI 5310G and MITS 5500G)
ENGR 5680G Information Theory

ENGR 5690G RF and Microwave Engineering for Wireless Systems
ENGR 5710G Network Computing (cross-listed with CSCI 5110G)
ENGR 5720G Pervasive and Mobile Computing (cross-listed with CSCI 5350G)
ENGR 5730G Advanced Algorithms and Data Structures
ENGR 5740G User Interface Design
ENGR 5750G Software Quality Management
ENGR 5760G Software Metrics
ENGR 5770G Service Computing (cross-listed with CSCI 5700G)
ENGR 5775G Knowledge Discovery and Data Mining
ENGR 5780G Advanced Computer Architecture
ENGR 5850G Analog Integrated Circuit Design
ENGR 5860G Digital Integrated Circuit Design
ENGR 5910G Embedded Real-Time Control Systems
ENGR 5915G Discrete Time Control Systems
ENGR 5920G Analysis and Control of Nonlinear Systems
ENGR 5930G Adaptive Control
ENGR 5940G Intelligent Control Systems
ENGR 5945G Mobile Robotic Systems
ENGR 5950G Computational Electromagnetics
ENGR 5960G Power System Operations, Analysis and Planning
ENGR 5970G Advanced Power Electronics
ENGR 5980G Advances in Nuclear Power Plant Systems
ENGR 5985G Advanced Power Plant Technologies
ENGR 5990G Utility Applications of Static Converters
ENGR 5995G Grid Integration of Renewable Energy Systems
ENGR 6001G PhD Candidacy Exam
ENGR 6002G Dissertation
ENGR 6003G PhD Seminar I
ENGR 6004G PhD Directed Studies
ENGR 6006G Workshops
ENGR 6013G PhD Seminar II

Courses are offered on the basis of demand with the expectation that most courses will be offered at a minimum of once every three years.

8.8 Engineering Management

8.8.1 Graduate faculty

Ahmad Barari, BSc, MSc, PhD, PEng

Michael Bennett, BS, MA, PhD, PEng

George Bereznai, BE, MEng, PhD, PEng

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Hossam Gaber, BSc, MSc, PhD

William Goodman, BA, MA, PhD

Ali Grami, MSc, MEng, PhD, PEng, SMIEEE

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Lixuan Lu, BESc, MESc, PhD

Rachid Machrafi, BSc, MSc, PhD

Jennifer Percival, BMath, PhD

Igor Pioro, BSc, MSc, PhD

Bale Reddy, BTech, MTech, PhD

Marc Rosen, BASc, MASc, PhD, PEng, FCSME, FEIC, FASME, FIEF, FCAE

Chirag Surti, BEng, MSc, PhD

Dan Zhang, BASc, MASc, PhD, PEng, FCSME

8.8.2 Program information

The graduate programs in Engineering Management allow students to study the areas of planning, allocating resources, and directing and controlling activities which have an engineering or technological component. Students learn to apply engineering principles for organizing and directing personnel and resources in technical projects.

The MEngM program provides courses in the areas of engineering project management, production planning and operations management, energy systems management, mathematical modeling and optimization as they pertain to complex engineering systems, quality control, health and safety, and applied risk analysis.

The Graduate Diploma in Engineering Management provides students with an alternative form of professional development when they do not wish to do a full master's degree but want to take graduate-level courses. Courses within the graduate diploma program are the same as those taken by the master's students in MEngM program and are taught by the same faculty.

8.8.3 Degree requirements

8.8.3.1 Master of Engineering Management

For the MEngM-Project program, students must complete seven courses and a research project for a total of 30 credits. Courses are selected as follows:

- Two courses (6 credits) from Group A in Section 8.8.4.
- One course (3 credits) from Group B in Section 8.8.4.
- One course (3 credits) from groups A, B, or C in Section 8.8.4.
- Three courses (9 credits) from one area of the engineering electives listed in Group D in Section 8.8.4.
- ENGR 5002G MEng/MEngM Project (9 credits).

For the MEngM-Course program, students must complete 10 courses for a total of 30 credits. Courses are selected as follows:

- Two courses (6 credits) total from Group A in Section 8.8.4.
- One course (3 credits) from Group B in Section 8.8.4.
- One course (3 credits) from groups A, B, or C (except ENGR 5002G MEng/MEngM Project) in Section 8.8.4.
- Three courses (9 credits) from one area of the engineering electives listed in Group D in Section 8.8.4.
- Three courses (9 credits) from Groups A, B, C (except ENGR 5002G MEng/MEngM Project), or D in Section 8.8.4. Only one of the three courses may be selected from Group B.

8.8.3.2 Graduate Diploma in Engineering Management

For the graduate diploma, students complete four courses for a total of 12 credits. Courses are selected as follows:

- Two courses (6 credits) from Group A in Section 8.8.4.
- One course (3 credits) from Group C in Section 8.8.4.
- One course (3 credits) from Group B or C (except ENGR 5002G MEng/MEngM Project) in Section 8.8.4.

8.8.4 Course listing

Group A - Core engineering management courses
ENGR 5410G Project Management for Engineers
ENGR 5415G Foundations of Engineering Management
ENGR 5420G Quality Management
ENGR 5425G Production and Operations Management
ENGR 5430G Energy Systems Management

Students can take NUCL 5010G Project Management for Nuclear Engineers as a substitute for ENGR 5410 Project Management for Engineers.

Group B – Core business courses
BUSI 5000G Business Communication*
BUSI 5010G Foundations of Business
BUSI 5100G Accounting Systems
BUSI 5200G Marketing Management
BUSI 5400G Quantitative Analysis in Business

Group C - Elective engineering management courses
ENGR 5002G MEng/MEngM Project
ENGR 5010G Advanced Optimization
ENGR 5014G Pollution Prevention and Sustainable Engineering
ENGR 5272G Design Engineering Management
ENGR 5275G Design for Product End of Life
NUCL 5350G Regulatory Affairs and Licensing Concepts
NUCL 5050G Applied Risk Analysis
NUCL 5090G Occupational Health and Safety
NUCL 5275G Safety Instrumented Systems

Group D - Engineering elective courses

The engineering elective courses are selected from one of the following graduate programs:

- Automotive Engineering
- Electrical and Computer Engineering
- Mechanical Engineering
- Nuclear Engineering

* BUSI 5000G Business Communication is worth only one credit instead of the usual three credits. Students should note that they will be short credits for the program if they do not enrol in sufficient other core business courses. Students should review the degree requirements in Section 8.8.3 carefully and consult with the graduate program director or faculty advisor prior to registering for courses.

8.9 Mechanical Engineering

8.9.1 Graduate faculty

Martin Agelin-Chaab, BSc, MEng, MSc, PhD, PEng

Ahmad Barari, BSc, MSc, PhD, PEng

George Bereznai*, BE, MEng, PhD, PEng

Ibrahim Dincer, BSc, MSc, PhD, FCSME, FEIC, FWIF

Gary Elfstrom, BASc, PhD, PEng

Moustafa El-Gindy, BSc, MSc, PhD, FASME

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Hossam Gaber, BSc, MSc, PhD

Kamiel Gabriel, BSc, MSc, MBA, PhD, PEng

Ismail Gultepe, BEng, MS, MP, PhD

Glenn Harvel, BEng, MEng, PhD, PEng

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Kevin Pope, BEng, MASc, PhD

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Subhash Rakheja, BEng, PhD

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Edward Waller, BSc, MScE, PhD, PEng

Zhaolin Wang, BSc, MSc, PhD

Bekir Sami Yilbas, BSc, MSc, PhD, DEng

Dan Zhang, BASc, MASc, PhD, PEng, FCSME

*Master's programs

8.9.2 Program information

The master's and doctoral programs in Mechanical Engineering allow a student to study all of the main areas associated with mechanical engineering. In

addition, the programs feature specialized fields of study in which students can focus and address key technical areas of the future that are expected to be in high demand by employers.

The MASc and MEng programs are comprised of three fields:

- Design
- Energy and Thermofluids Engineering
- Mechatronics and Manufacturing Engineering

The PhD program is also comprised of three fields:

- Automotive Engineering
- Energy and Thermofluids Engineering
- Mechatronics and Manufacturing Engineering

Alternatively, a student can choose to cover many facets of the broad discipline of mechanical engineering. Topics can vary widely and may include robotics, automation and mechatronics; mechanics, controls and computer-aided design; and thermofluids and heat transfer. Mechanical engineering is often interdisciplinary, overlapping significantly with such disciplines as electrical, computer and software engineering. Opportunities exist for graduate students to explore these areas.

8.9.3 Degree requirements

8.9.3.1 Master of Applied Science in Mechanical Engineering

The objective of the MASc program in Mechanical Engineering is to prepare students for careers in research, development and advanced engineering. Graduates of the program will be able to work as engineers in research and development or other areas in advanced technology companies or government agencies, or continue their education and pursue a PhD degree. The objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar and a research thesis.

General MASc degree requirements are stipulated in Section 8.5.1. For the MASc in Mechanical Engineering, students must complete five courses for a total of 15 credits and a thesis worth 15 credits. Students must also successfully complete ENGR 5003G MASc Seminar and ENGR 5001G MASc Thesis. Students who select the Design field will be required to take at least one of the Design courses numbered as 527XG.

8.9.3.2 Master of Engineering in Mechanical Engineering

The objective of the MEng program in Mechanical Engineering is to provide the opportunity for engineers in industry to upgrade and expand their skills, including the development of research skills. Graduates of the program will be able to apply what they have learned in a variety of applications in industry, government and academia. Depending on which option the student selects, the objective of the MEng program can be achieved through either a combination of course work and a project or solely course work. MEng students have exposure to research through projects included in most of the graduate courses.

General MEng degree requirements are stipulated in Section 8.5.1. For the MEng-Project option, students must complete seven courses worth a total of 21 credits and a project worth nine credits (ENGR 5002G MEng/MEngM Project). For the MEng-Course option, students must complete 10 courses worth a total of 30 credits. Students who select the Design field will be required to take at least one of the Design courses numbered as 527XG.

8.9.3.3 Doctor of Philosophy in Mechanical Engineering

Students in the PhD program must complete four courses worth a total of 12 credits, the PhD Candidacy Exam (ENGR 6001G), Seminar I (ENGR 6003G), Seminar II (ENGR 6013G), Workshops (ENGR 6006G) and a dissertation worth 40 credits (ENGR 6002G).

A student who has been approved to transfer directly into the PhD program after one full year in the MASc program must complete nine courses worth a total of 27 credits, Seminar I (ENGR 6003G), Seminar II (ENGR 6013G), Workshops (ENGR 6006G) and a dissertation worth 40 credits (ENGR 6002G).

Within 18 months of entry into the PhD program, PhD students must prepare a written research proposal and pass the oral PhD candidacy exam (ENGR 6001G). PhD students must successfully defend their dissertation (ENGR 6002G) in front of an examining committee.

8.9.4 Course listing

In the list of engineering graduate courses below, courses related to the Energy and Thermofluids Engineering field are numbered as ENGR 51xxG. Courses related to the Mechatronics and Manufacturing Engineering field are numbered as ENGR 5221G through ENGR 5263G. Courses related to the Design field are numbered as ENGR 527XG.
PhD students may select from the courses listed for Energy and Thermofluids

Engineering, Mechatronics and Manufacturing Engineering, and the core automotive courses (ENGR 53xxG) listed in Section 8.6.4.

Courses numbered ENGR 50xxG are common to all fields. Note that ENGR 6000-level courses are restricted to PhD students.

ENGR 5001G MASc Thesis
ENGR 5002G MEng/MEngM Project
ENGR 5003G MASc Seminar
ENGR 5004G MASc/MEng Directed Studies
ENGR 5005G Special Topics
ENGR 5010G Advanced Optimization
ENGR 5011G Advanced Engineering Design
ENGR 5012G Advanced and Smart Materials
ENGR 5013G Advanced Engineering Mathematics
ENGR 5015G Advanced Computer Aided Geometric Design
ENGR 5100G Advanced Energy Systems
ENGR 5101G Thermal Energy Storage
ENGR 5102G Fuel Cells and Hydrogen Systems
ENGR 5120G Advanced Fluid Mechanics
ENGR 5121G Advanced Turbo Machinery
ENGR 5122G Computational Fluid Dynamics
ENGR 5140G Advanced Heat Transfer
ENGR 5141G Heat Exchanger Design and Analysis
ENGR 5160G Advanced Thermodynamics
ENGR 5161G HVAC and Refrigeration Systems Design and Analysis
ENGR 5180G Advanced Nuclear Engineering
ENGR 5181G Advanced Radiation Engineering
ENGR 5221G Computer-Integrated Manufacturing
ENGR 5222G Polymers and Composite Processing
ENGR 5223G Advanced Manufacturing Processes and Methodologies
ENGR 5240G Advanced Dynamics
ENGR 5241G Advanced Mechanics of Materials
ENGR 5242G Advanced Vibrations
ENGR 5243G Mechanics and Dynamics of Machine Tools
ENGR 5244G Advanced Acoustics and Noise Control
ENGR 5260G Advanced Robotics and Automation
ENGR 5261G Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5262G Manipulator and Mechanism Design
ENGR 5263G Advanced Control
ENGR 5271G Innovative Design Engineering

ENGR 5272G Design Engineering Management
ENGR 5273G Design by Failure
ENGR 5274G Design of Sustainable Mobility Systems
ENGR 5275G Design for Product End of Life
ENGR 6001G PhD Candidacy Exam
ENGR 6002G Dissertation
ENGR 6003G PhD Seminar I
ENGR 6004G PhD Directed Studies
ENGR 6006G PhD Workshops
ENGR 6013G PhD Seminar II

Section 9: Graduate Programs Offered by the Faculty of Health Sciences

9.1 Contact information

Faculty of Health Sciences
University of Ontario Institute of Technology (UOIT)
2000 Simcoe Street North
Oshawa, Ontario L1H 7K4
Canada

905.721.3166
905.721.3179 (fax)
healthsciences@uoit.ca
healthsciences.uoit.ca

9.2 Graduate degree offered

Master of Health Sciences (MHSc)

9.2.1 Affiliated programs

The following programs are affiliated with the Faculty of Health Sciences:

- Master of Science in Applied Bioscience (offered in collaboration with the Faculty of Science—see Section 10 for program information).
- Doctor of Philosophy in Applied Bioscience (offered in collaboration with the Faculty of Science—see Section 10 for program information).

9.3 Graduate faculty

Jennifer Abbass Dick, RN, BNSc, MN, PhD

Shahid Alvi, BA, MA, PhD

Robert Balogh, BHSc (PT), MSc, PhD

Emma Bartfay, BSc, MSc, PhD

Wally Bartfay, RN, MN, PhD

Michael Bennett, BS, MA, PhD

Toba Bryant, MSW, PhD

Carolyn Byrne, RN, MHSc, PhD

Julie Clarke, RN, BSc, MA

Sue Coffey, RN, BScN, MN, PhD

Pierre Côté, DC, FCCS(c), MSc, PhD

Shilpa Dogra, MSc, PhD, CSEP-CEP

Aziz Douai, BA, MA, PhD

Mikael Eklund, BSc (Eng), MSc (Eng), PhD, PEng

Brenda Gamble, BA, MSc, PhD

Sandra Gardner, BSc (Hons), MMath, PhD

Clemon George, BSc, MSc, PhD

William Goodman, BA, MA, PhD

Judith Grant, BA, MA, PhD

Mark Green, BSc, MSc, PhD

Michael Holmes, BKin, MSc, PhD

Samuel Howarth, BSc, MSc, PhD

Patrick Hung, BSc, MPhil, MASc, PhD

Carolyn Hunt, MD

Andrew James, MBChB, MBI, FRACP, FRCPC

Janice Jones, RN, BScN, MN

Holly Jones-Taggart, BSc (Hons), PhD

Bill Kapralos, BSc, MSc, PhD

Ayush Kumar, PhD

Manon Lemonde, RN, PhD

Gail Lindsay, BASc, MSc, PhD

Ramiro Liscano, BScEng, MScEng, PhD, PEng, SMIEEE

Meghann Clare Lloyd, BKin (Hons), MA, PhD, PD

Patrick Loisel, MD

Fletcher Lu, BSc, MSc, PhD

Lauranne Matheson, BSc

Carolyn McGregor, BAppSc (Comp.Sc), PhD

Tom McLellan, PhD

Silvano Mior, DC, PhD

Bill Muirhead, BA, MEd, PhD

Bernadette Murphy, BA, DC, MSc, PhD

Mika Nonoyama, RRT, PhD

Edward Osborne, MD

Elita Partosoedarso, BSc, MEd, PhD

Jennifer Percival, BMath, PhD

Kevin Power BKin, CEP, MPE, PhD, PDF

Milly Ryan-Harshman, PhD

John Samis, BSc (Hons), PhD

Otto Sanchez, MD, MSc, PhD

Kamran Sartipi, BSc, MSc, MMAth, PhD, PEng

Dorthea Service, RN, BScN, MN

Nicola Shaw, BSc (Hons), PhD

Wendy Stanyon, RN, EdD

Heidi Haavik, PhD

John Triano, BSc, DC, MA, PhD

Roland Van Oostveen, BSc (Hons), MEd, PhD

Miguel Vargas Martin, BSc, MASc, PhD, PEng

Ellen Vogel, PhD, RD, FDC

Robert Weaver, PhD

Paul Yielder, Dip Ed. DCR(R), PhD

Arshia Zaidi, BA, MA, PhD

Hilde Zitzelberger, RN, BScN, MSc, PhD

9.4 Program information

The MHSc program focuses on providing students with opportunities to develop the knowledge and skills required to conduct high-quality research projects that culminate in a master's thesis or major project.

Graduate training focuses on research conducted in one of three key areas in the Health Sciences:

- Community Health
- Health Informatics
- Kinesiology

Students in the Community Health stream will develop a broad understanding of how the physical and social context shapes health, illness and health care. In particular, this includes research and analysis of cultural and economic differences and their implications for health and health care for diverse populations. Students will learn strategies to engage communities in efforts to reduce illness and promote health.

Students in the Health Informatics stream will develop strategies to actively participate in multidisciplinary collaborations with diverse groups (e.g., patients, clinicians, health care managers, computer scientists, engineers) and will learn to assess and deploy the latest in computing and informatics systems to support efficient health care delivery. The Health Informatics stream prepares students to identify, develop and manage health care information systems that support health care administration, management, policy, training, clinical management and clinical research.

Students in the Kinesiology stream will synthesize current research and integrate practical and theoretical knowledge to understand how and why exercise and physical activity can be used as an intervention to promote health and well-being in a range of populations, including those with developmental delays; children and adolescents; adults with chronic pain, cardiovascular, respiratory, metabolic,

psychiatric and neurological disease; as well as recreational and high-performance athletes. Students will have the option of diverse research experiences in the kinesiology area ranging from intensive laboratory-based studies with human populations to interventional studies with special populations.

As a research-based degree, students will combine course work, seminars and independent research to achieve the program's core objectives. Two required courses, Research in the Health Sciences and either Studies in Community Health (Community Health), Patient Journey Modeling (Health Informatics) or Studies in Kinesiology (Kinesiology), lay the foundation for more focused course work and independent research under the guidance of a research supervisor and supervisory committee. By virtue of the strong research foundation and substantive training obtained throughout their education, graduates from the MHSc program will be well prepared to take on higher-level occupations within the health profession, seek funding for projects or research to be undertaken at their workplace, or pursue a PhD in a research-oriented health sciences or related program.

9.5 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, MHSc applicants must meet the following program-specific requirements:

- Undergraduate preparation in research methods in either quantitative or qualitative analysis. This should include experience and training in statistics. Applicants planning to study in the field of Health Informatics should also have training or experience with computing or information technology within the health care domain. To assist with the assessment of the application, applicants should submit detailed descriptions of any completed courses in these areas. Course descriptions should be copied from the university's academic calendar.
- Each applicant who expresses a desire to pursue the field in Kinesiology in the MHSc program will be expected to have an honours undergraduate degree in Kinesiology, or a related field.
- If applicable, a minimum score of 580 on the paper-based TOEFL, 92-93 on the Internet-based TOEFL or 7 on the IELTS. Note that these English language proficiency scores are slightly higher than those required for some other graduate programs at UOIT. Language requirements are specified in Section 3.4.4.

Experience in the areas of health promotion and health care is an asset.

9.6 Part-time studies

To facilitate access to all potential students, part-time studies are permitted.

9.7 Degree requirements

To earn the MHSc degree, students are required to complete a program of study worth 30 credits, typically 15 course credits and a thesis or 21 course credits and a major project. All MHSc students must complete HLSC 5010G Research in the Health Sciences and either HLSC 5096G MHSc Thesis in Health Sciences or HLSC 5097G MHSc Graduate Project in Health Sciences. Students who select the Community Health field are required to complete HLSC 5020G Studies in Community Health. Students who select the Health Informatics field are required to complete HLSC 5050G Patient Journey Modelling. Students who select the Kinesiology field are required to complete HLSC 5030G Studies in Kinesiology.

Students in the thesis option must complete an additional three elective courses, at least two of which chosen from a list of designated electives. Students in the project option must complete an additional five electives, at least three of which chosen from a list of designated electives.

In consultation with a research supervisor and supervisory committee, if applicable, the thesis or major project topic is identified and the proposal is developed during the first year of study. In the second year of study, the thesis research or major project is completed. Thesis-based students must pass an oral examination. Students who complete a major project will present their work at one or more professional forums.

9.8 Course listing

Required courses for all MHSc students
HLSC 5010G Research in the Health Sciences
HLSC 5096G MHSc Thesis in Health Sciences or HLSC 5097G MHSc Graduate Project in Health Sciences

Required course for field of Community Health
HLSC 5020G Studies in Community Health

Required course for field of Health Informatics
HLSC 5050G Patient Journey Modelling

Required course for field of Kinesiology
HLSC 5030G Studies in Kinesiology

Designated electives for field of Community Health

HLSC 5050G Patient Journey Modelling
HLSC 5060G Special Topics in Health Sciences Research
HLSC 5070G Research-in-Progress Colloquium I*
HLSC 5071G Research-in-Progress Colloquium II*
HLSC 5111G Public Policy and Health Promotion
HLSC 5113G Strategies in Health Promotion Practice
HLSC 5115G Community Health of Vulnerable Populations
HLSC 5117G Epidemiology
HLSC 5118G Applied Biostatistics in Health Sciences
HLSC 5119G Program Evaluation
HLSC 5121G Living with Persistent Conditions
HLSC 5122G Successful Ageing
HLSC 5123G Advanced Qualitative Methods in Health Research
HLSC 5190G Advanced Topics in Community Health Research
HLSC 5290G Advanced Topics in Patient Journey Modelling
HLSC 5310G Biology of Infectious Disease
HLSC 5312G Research Topics on Human Pathophysiology
HLSC 5314G Environmental Determinants of Health (cross-listed with APBS 6200G)
HLSC 5316G Cancer Biology
HLSC 5320G Neuroscience in Rehabilitation Kinesiology

Designated undergraduate electives for Community Health

HLSC 4910 Introduction to Community Based Research for Health

Designated electives for field of Health Informatics

HLSC 5060G Special Topics in Health Sciences Research
HLSC 5070G Research-in-Progress Colloquium I*
HLSC 5071G Research-in-Progress Colloquium II*
HLSC 5118G Applied Biostatistics in Health Sciences
HLSC 5122G Successful Ageing
HLSC 5123G Advanced Qualitative Methods in Health Research
HLSC 5203G Adoption, Use and Impact of Health Informatics Systems
HLSC 5204G Artificial Intelligence in Health Care
HLSC 5290G Advanced Topics in Patient Journey Modelling
HLSC 5291G Advanced Topics in Health Informatics Research
HLSC 5322G Theory and Application of Biomedical Signals and Images
MITS 5110G Legal Issues, Ethics and Incident Handling in IT Security
MITS 5400G Secure Software Systems

ENGR 5720G Pervasive and Mobile Computing (cross-listed with CSCI 5350G)
ENGR 5740G User Interface Design
ENGR 5750G Software Quality Management
ENGR 5770G Service Computing (cross-listed with CSCI 5700G)

Designated undergraduate electives for field of Health Informatics
HLSC 4201 Advanced Health Information Management
HLSC 4610 Systems Analysis in Health Care

Designated electives for field of Kinesiology
HLSC 5020G Studies in Community Health
HLSC 5050G Patient Journey Modelling
HLSC 5060G Special Topics in Health Sciences Research
HLSC 5070G Research-in-Progress Colloquium I*
HLSC 5071G Research-in-Progress Colloquium II*
HLSC 5111G Public Policy and Health Promotion
HLSC 5113G Strategies in Health Promotion Practice
HLSC 5115G Community Health of Vulnerable Populations
HLSC 5117G Epidemiology
HLSC 5118G Applied Biostatistics in Health Sciences
HLSC 5119G Program Evaluation
HLSC 5121G Living with Persistent Conditions
HLSC 5122G Successful Ageing
HLSC 5123G Advanced Qualitative Methods in Health Research
HLSC 5310G Biology of Infectious Disease
HLSC 5312G Research Topics on Human Pathophysiology
HLSC 5314G Environmental Determinants of Health (cross-listed with APBS 6200G)
HLSC 5316G Cancer Biology
HLSC 5320G Neuroscience in Rehabilitation Kinesiology
HLSC 5322G Theory and Application of Biomedical Signals and Images
HLSC 5390G Advanced Topics in Kinesiology

Designated undergraduate electives for field of Kinesiology

Students may take one of the undergraduate elective courses for Kinesiology listed as long as they have not previously taken its undergraduate equivalent.

HLSC 4412 Exercise Rehabilitation I
HLSC 4413 Exercise Rehabilitation II
HLSC 4414 Advanced Topics in Neuromuscular Physiology and Pathophysiology
HLSC 4460 Selected Topics in Physical Activity and Health
HLSC 4472 Clinical Biomechanics and Ergonomics
HLSC 4482 Advanced Exercise Prescription

*Students must be registered in both HLSC 5070G and HLSC 5071G to receive elective credit for these courses.

Note: Course descriptions for the undergraduate courses listed above can be found in the 2014-2015 Undergraduate Academic Calendar and Course Catalogue located on the UOIT website at **uoit.ca**.

Section 10: Graduate Programs Offered by the Faculty of Science

10.1 Contact information

Faculty of Science
University of Ontario Institute of Technology (UOIT)
2000 Simcoe Street North
Oshawa, Ontario L1H 7K4
Canada

905.721.3050
905.721.3304 (fax)
gradsecretary@science.uoit.ca
science.uoit.ca

10.2 Graduate degrees offered

The following graduate programs are offered by the Faculty of Science:

Applied Bioscience (offered in collaboration with the Faculty of Health Sciences)

- Master of Science (MSc)
- Doctor of Philosophy (PhD)

Computer Science (offered in collaboration with the Faculty of Business and Information Technology and the Faculty of Engineering and Applied Science)

- MSc
- PhD

Materials Science (offered jointly with Trent University)

- MSc
- PhD

Modelling and Computational Science

- MSc
- PhD

10.3 Applied Bioscience

10.3.1 Graduate faculty

Yuri Bolshan, PhD

Dario Bonetta, BSc, MSc, PhD

Michelle Bowman, PhD

Jean-Paul Desaulniers, BSc, PhD

Brad Easton, BSc (Hons), PhD

Shari Forbes, BSc (Hons), PhD

Sean Forrester, BSc, MSc, PhD

Julia Green-Johnson, BSc (Hons), MSc, PhD

Cecilia Hageman, PhD

Douglas Holdway, BSc (Hons), MSc, PhD

Michael Holmes, PhD

Holly Jones-Taggart, BSc (Hons), PhD

Martin Kalmokoff, PhD

Andrea Kirkwood, BES, MSc, PhD

Ayush Kumar, BSc, MSc, PhD

Helene LeBlanc, BSc (Hons), MSc, PhD

Bernadette Murphy, BA, DC, MSc, PhD

Steven Passmore, PhD

John Samis, BSc (Hons), PhD

Otto Sanchez, MD, MSc, PhD

Deborah Saucier, PhD

Janice Strap, BSc, MSc, PhD

Jim Sutcliffe, PhD

Russell Viirre, BSc (Hons), PhD

Paul Yielder, Dip Ed. DCR(R), PhD

10.3.2 Program information

The primary objective of the MSc and PhD programs in Applied Bioscience is to train students to become high-quality researchers at the interface between chemistry and biology. The Faculty of Science, with no traditional departments, exposes students to interdisciplinary research, allowing them to gain experience working successfully within collaborative networks. The graduate programs equip students with a wide array of both practical and conceptual scientific skills that prepare them for leadership roles in the life sciences. These goals are achieved through independent research and rigorous interdisciplinary course work. The programs bring together students and faculty from a variety of scientific backgrounds, which further enriches the student learning experience. In addition, in keeping with UOIT's strategic plan, research is aimed at creating innovations that will improve the lives of Canadians.

Graduates from these programs are expected to have a breadth of knowledge in the life sciences, a depth of knowledge in their chosen field, and the scientific and technical skills that are essential for a career in research. It is also expected that graduates will continue to make significant contributions to the advancement of knowledge in their field and become lifelong scholars with an appreciation of the impact of science on society.

The programs capitalize on the faculty's current research expertise which is reflected in the four fields in the MSc and PhD programs:

- Biomolecular Science
- Ecosystem Health
- Forensic Bioscience
- Human Health Biology

These fields are interdisciplinary in nature and require students to rely on both chemistry and biology research methods in order to answer specific research questions.

Biomolecular science focuses on the use of molecular and cellular tools to investigate mechanisms of cell function; new approaches for combating infectious organisms and disease; biomaterials and bio-based products; drug discovery, drug formulation and site-specific drug delivery; the mechanisms of action of pharmaceuticals at the cellular and molecular level; and the molecular and cellular aspects of the immune system in response to pathogenic and non-

pathogenic micro-organisms. Research in this field occurs at the interface of biology and chemistry.

The field of ecosystem health focuses on determining the implications of external toxicants on the health of ecosystems, discovering indicators for environmental problems and developing methods to lessen human exposure to toxicants. In addition, researchers in the program investigate related areas such as environmental microbiology, the pathophysiology of environmental disorders and the micro and macro environmental factors causing cancer. Finally, research in the field focuses on specific environmental problems and the development of solutions that benefit Canadians.

Forensic bioscience is a distinct field that combines special content areas of biological and chemical sciences with training in legal and forensic investigations. National security, bioterrorism and global pandemics are just three examples of areas in which skilled forensic bioscience workers will be in high demand in the future. For many scientists, the field of forensic bioscience crystallizes an area of research at the interface between biology, chemistry, forensic science and legal science.

Human health biology addresses the basic understanding of common human diseases; in particular, those with direct relevance to human health. Efforts in this new field concentrate on laboratory-based research that will translate into disease prevention, health promotion and novel therapeutic interventions. The four main areas of investigation are human infectious diseases, cancer, musculoskeletal disorders and coagulopathies. This field is further characterized by interdisciplinary research at the interface of several complementary core disciplines.

10.3.3 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, Applied Bioscience applicants must meet the following program-specific requirements.

Master of Science in Applied Bioscience

Hold an honours undergraduate degree in biology, chemistry or related area.

To assist with the assessment of the application, applicants may be asked to provide course numbers, titles and brief descriptions of course content; textbooks used and/or chapters covered; and grades received in relevant areas of study.

Admission depends on the availability of a research supervisor. Applicants should contact the potential supervisor and/or the graduate program director before formally applying.

Doctor of Philosophy in Applied Bioscience

Completion of an MSc-level degree in biology, chemistry or related area at a Canadian university or its equivalent.

Prior to being accepted into the program, PhD applicants must be accepted by a professor who specializes in their desired area of research and who is willing to act as a supervisor.

Under exceptional circumstances, MSc students in Applied Bioscience may transfer directly to the PhD program after completing one academic year in the MSc program if the following conditions are met:

1. Completion of a full master's program of course work (three courses worth a total of nine credits), with at least an A-minus average.
2. Strong evidence of research ability.
3. Approval of the direct transfer by the research supervisor(s) and the supervisory committee. The transfer must also be approved by the graduate program director and the Dean of Graduate Studies.

See Section 3.4.2.1 for additional information.

10.3.4 Part-time studies

The MSc and PhD programs are intended to be full-time programs. Therefore, there is currently no part-time enrolment.

10.3.5 Degree requirements

10.3.5.1 Master of Science in Applied Bioscience

Students must successfully complete three 3-credit courses, including APBS 6010G Research in Applied Bioscience, one elective course and one special topics course related to their designated field. In addition, they must complete the required non-credit course APBS 6030G Seminar in Applied Bioscience and prepare and orally defend a thesis (APBS 6020G) and receive a pass.

Core courses (required)
APBS 6010G Research in Applied Bioscience (3 credits)
APBS 6020G MSc Thesis in Applied Bioscience (21 credits)
APBS 6030G Seminar in Applied Bioscience (0 credits)

Elective courses

APBS 6100G Advanced Cell and Molecular Biology (3 credits)
APBS 6200G Environmental Determinants of Health (3 credits) (cross-listed with HLSC 5314G)
APBS 6300G Advanced Topics in Biological Chemistry (3 credits)
APBS 6400G Advanced Topics in Forensic Bioscience (3 credits)
APBS 6500G Advanced Topics in Medicinal Chemistry (3 credits) (cross-listed with CHEM 4510)

Special topics courses

APBS 7100G Special Topics in Biomolecular Science (3 credits)
APBS 7200G Special Topics in Ecosystem Health (3 credits)
APBS 7300G Special Topics in Forensic Bioscience (3 credits)
APBS 7400G Special Topics in Human Health Biology (3 credits)

Proposed progression through program

Year 1

APBS 6010G Research in Applied Bioscience
One elective course and one special topics course
Initiation of research program

Year 2

Master's thesis research
APBS 6020G MSc Thesis in Applied Bioscience
APBS 6030G Seminar in Applied Bioscience

10.3.5.2 Doctor of Philosophy in Applied Bioscience

Students must complete APBS 6010G Research in Applied Bioscience, one elective course from those listed in Section 10.3.5.1, one special topics course specific to their field and APBS 7070G PhD Dissertation. The research dissertation must constitute a new contribution to the field of study. In addition to the three courses and dissertation, students must successfully complete APBS 7050G Research Seminar in Applied Bioscience and APBS 7040G PhD Thesis Proposal and Candidacy Exam. The latter is to be completed within 18 months of entry into the PhD program and consists of a written research proposal and an oral exam. Finally, students must make satisfactory progress in their research (evaluated yearly) and enrol each year in APBS 7060G PhD Research.

Students who transfer directly from the MSc in Applied Bioscience into the PhD program must complete APBS 7050G Research Seminar in Applied Bioscience,

APBS 7040G PhD Thesis Proposal and Candidacy Exam, APBS 7060G PhD Research and APBS 7070G PhD Dissertation.

10.3.6 Course listing

APBS 6010G Research in Applied Bioscience
APBS 6020G MSc Thesis in Applied Bioscience
APBS 6030G Seminar in Applied Bioscience
ABPS 6100G Advanced Cell and Molecular Biology
APBS 6200G Environmental Determinants of Health (cross-listed with HLSC 5314G)
APBS 6300G Advanced Topics in Biological Chemistry
APBS 6400G Advanced Topics in Forensic Bioscience
APBS 7040G PhD Thesis Proposal and Candidacy Exam
APBS 7050G Research Seminar in Applied Bioscience
APBS 7060G PhD Research
APBS 7070G PhD Dissertation
APBS 7100G Special Topics in Biomolecular Science
APBS 7200G Special Topics in Ecosystem Health
APBS 7300G Special Topics in Forensic Bioscience
APBS 7400G Special Topics in Human Health Biology

10.4 Computer Science

10.4.1 Graduate faculty

Dhavide Aruliah, BSc, MSc, PhD

Michael Bennett, BS, MA, PhD

Jeremy Bradbury, BSc, MSc, PhD

David Clark, BA, LL.B, LL.M

Christopher Collins, BSc, MSc, PhD

Karen Collins, PhD

Dominic Covvey, PhD

Francois Desjardins, BA, BEd, PhD

Mikael Eklund, BSc, MSc, PhD

Khalil El-Khatib, BCompSc, MCompSc, PhD

Mark Green, BSc, MSc, PhD

Shahram Heydari, BEng, MEng, MAppSci, PhD

Andrew Hogue, BSc, MSc, PhD

Shih-Chia Huang, PhD

Patrick Hung, BSc, MPhil, MASc, PhD

Andrew James, PhD

Kamen Kanev, PhD

Bill Kapralos, BSc, MSc, PhD

Xiaodong Lin, BSc, MSc, PhD

Ramiro Liscano, BScEng, MScEng, PhD, PEng, SMIEEE

Fletcher Lu, BSc, MSc, PhD

John R. Madill, BA

Stephen Marsh, PhD

Peter Mason, BSc, MSc, PhD

Carolyn McGregor, BAppSc (Comp.Sc), PhD

Ruth Milman, BASc, MASc, PhD

Pejman Mirza-Babaei, PhD

Lennart Nacke, PhD

Richard Pazzi, BSc, MSc, PhD

Jennifer Percival, BMath, PhD

Ken Pu, BASc, MASc, PhD

Faisal Qureshi, BSc, MSc (Electronics), MSc (Computer Science), PhD

Shahryar Rahnamayan, BSc, MS, PhD, PEng

Jing Ren, BA, MSc, PhD

John Rowcroft, BSc (Hons), MSc, PhD

Kamran Sartipi, BSc, MSc, MMath, PhD, PEng

Deborah Saucier, PhD

Wei Shi, BCompEng, MCS, PhD

Jay Shiro Tashiro, RN, BSN, PhD

Isaac Tamblyn, BSc, PhD

Julie Thorpe, BCompSci, PhD

Roland Van Oostveen, BSc (Hons), MEd, PhD

Miguel Vargas Martin, BSc, MASc, PhD, PEng

Ying Zhu, BSc, MSc, PhD

10.4.2 Program information

The MSc in Computer Science is a broad-based program that covers concepts from engineering, science and business with the aim of producing high-quality software professionals. The PhD program focuses on applied research with the aim of producing highly trained researchers for industry and academia. Both programs have a strong research focus.

There are four fields in the MSc and PhD programs:

- Digital Media
- Information Science
- Networks and IT Security
- Software Design

The aim of the MSc and PhD programs in Computer Science is to produce a new breed of computer science graduates that have a broad background in information technology along with project management and people skills. The graduates of these programs will not only have strong technical expertise in their particular field but will also have the ability to work effectively in interdisciplinary teams. They are able to tackle problems that require both technical and non-technical solutions.

The MSc and PhD programs differ from most existing computer science programs in their concentration on applied research and the development of professional skills. The intention is that most of the graduates from these programs will build careers in industrial research and software development. The PhD program also prepares graduates for careers in academia, but it is expected

that most of the graduates from this program will select careers in industry. The UOIT programs focus on the skills required for successful careers in industry, reflecting UOIT's goals to be market-oriented and to provide high-quality professional education.

The MSc and PhD programs give students the opportunity to work in teams and develop leadership skills. Students are also given ample opportunity to develop oral and written communication skills.

The MSc students are strongly encouraged to present their research results at scientific conferences, and the PhD students are also expected to do so before defending their thesis.

10.4.3 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, Computer Science applicants must meet the following program-specific requirements.

Master of Science in Computer Science

Hold a four-year honours undergraduate degree in computer science, computer engineering, information technology or software engineering from a Canadian university, or its equivalent from a recognized institution.

Doctor of Philosophy in Computer Science

The minimum admission requirement for the PhD program is completion of a master's degree in computer science, computer engineering, information technology or software engineering from a Canadian university, or its equivalent (such as the UOIT Master of Health Sciences [Health Informatics]) from a recognized institution.

In exceptional circumstances, students may be directly admitted to the PhD from an undergraduate program.

Applicants without the background above may be offered admission with additional requirements which will enable them to obtain the required background through additional courses or some other mechanism.

10.4.4 Part-time studies

The MSc and PhD programs are intended to be full-time programs, but a small number of part-time students are admitted to increase its accessibility. The typical part-time student is already employed in the information technology industry and brings a level of practical experience to the program. Part-time students are encouraged to attend seminars on campus and to spend at least two weeks per year on campus so they have an opportunity to interact with other students outside of the classroom.

10.4.5 Degree requirements

10.4.5.1 Master of Science in Computer Science

All MSc students are required to successfully complete five graduate courses plus a thesis. In the first year of their program, all students must take CSCI 5010G Survey of Computer Science and CSCI 5020G Collaborative Design and Research. The remaining three courses are selected from the list of approved courses for the program with the restriction that a student can take at most two courses from the same field. The course selection is made in consultation with the student's research supervisor and must be approved by the graduate program director. Before defending their thesis, students must present the results of his or her research in a seminar that is open to the public. The MSc degree requirements are summarized in the following table.

Requirement	Credits
CSCI 5010G Survey of Computer Science	3
CSCI 5020G Collaborative Design and Research	3
Elective courses (3)	9
CSCI 5001G MSc Thesis	15

10.4.5.2 Doctor of Philosophy in Computer Science

All PhD students are expected to complete at least four graduate courses, two of which must be at the advanced 6000 level. Students who are directly admitted to the PhD program from an undergraduate degree must complete nine courses. CSCI 5010G Survey of Computer Science and CSCI 5020G Collaborative Design and Research must be taken in the first year, if they have not been previously taken at the master's level.

All PhD students must demonstrate a broad knowledge of computer science. This is normally demonstrated through the completion of an appropriate set of courses at the graduate level. To satisfy the breadth requirement, the student must successfully complete courses from the following three areas:

- One course in computational science
- Two courses in computer systems
- Two courses in computer applications

When a student is admitted to the PhD program, the graduate committee of the faculty evaluates the courses from his/her previous degrees to determine which courses count towards the breadth requirement and identify the areas in which more courses are required. The list of graduate courses offered each year indicates the area covered by each course so students can easily plan to cover the breadth requirement.

At least nine months before the thesis defence, a PhD student must present and defend his or her thesis proposal. The defence takes the form of an oral examination.

Each PhD student must present two public seminars during the course of his/her studies. The first must be held just before the proposal defence and cover the proposed research program. The second seminar must be held just before the thesis defence and cover the results of the research program.

10.4.6 Course listing

General courses
CSCI 5001G MSc Thesis
CSCI 5010G Survey of Computer Science
CSCI 5020G Collaborative Design and Research
CSCI 5030G Automata and Applications
CSCI 5040G Epistemology of Science
CSCI 6001G PhD Dissertation
CSCI 6020G Formal Methods for Computer Science
CSCI 7010G PhD Thesis Proposal and Candidacy Exam

Software Design courses

CSCI 5100G Development of Concurrent Software
CSCI 5110G Network Computing (cross-listed with ENGR 5710G)
CSCI 5120G Principles of Distributed Computing
CSCI 5130G Programming Language Implementation
CSCI 5140G Ecology of Online Learning
CSCI 5150G Evolution or Revolution: Informatics Design Principles
CSCI 5160G Topics in Software Design
CSCI 5170G Empirical Software Engineering
CSCI 6100G Advanced Topics in Software Design

Networks and IT Security courses

CSCI 5300G Computer Communication Networks (cross-listed with ENGR 5660G and MITS 5200G)
CSCI 5310G Cryptography and Secure Communications (cross-listed with ENGR 5670G and MITS 5500G)
CSCI 5320G Malware Analysis
CSCI 5330G Network Optimization
CSCI 5340G Performance Evaluation of Computer Networks
CSCI 5350G Pervasive and Mobile Computing (cross-listed with ENGR 5720G)
CSCI 5360G Topics in Networks
CSCI 5370G Topics in IT Security
CSCI 6300G Advanced Network Design
CSCI 6310G Advanced Topics in Networks
CSCI 6320G Advanced Topics in IT Security

Digital Media courses

CSCI 5500G Auditory Perception and Virtual Audio
CSCI 5510G Computer Graphics
CSCI 5520G Computer Vision and Games
CSCI 5530G Serious Game Development
CSCI 5540G User Interface Technology
CSCI 5550G Topics in Digital Media
CSCI 6500G Advanced Computer Animation
CSCI 6510G Visual Modelling
CSCI 6520G Advanced Topics in Digital Media

Information Science courses

CSCI 5700G Introduction to Services Computing (cross-listed with ENGR 5770G)
CSCI 5710G Services Computing Security
CSCI 5720G Topics in Health Informatics
CSCI 5730G Topics in Information Science
CSCI 5740G Intelligent Systems
CSCI 6700G Advanced Information Management
CSCI 6710G Advanced Topics in Health Informatics
CSCI 6720G Advanced Topics in Information Science

The following courses from other UOIT graduate programs may be selected by students in the MSc and PhD in Computer Science:

MCSC 6020G Numerical Analysis[1]
MCSC 6030G High-Performance Computing[1]
MCSC 6230G Advanced Topics in High-Performance Computing[1]
ENGR 5775G Knowledge Discovery and Data Mining[2]
ENGR 5910G Embedded Real-Time Control Systems[2]
ENGR 5940G Intelligent Control Systems[2]
HLSC 5050G Patient Journey Modelling[3]
HLSC 5203G Adoption, Use and Impact of Health Informatics Systems[3]
HLSC 5290G Advanced Topics in Patient Journey Modelling[3]
MITS 5110G Legal Issues, Ethics and Incident Handling in IT Security[4]

[1] MSc in Modelling and Computational Science
[2] Master of Applied Science in Electrical and Computer Engineering
[3] Master of Health Sciences – field in Health Informatics
[4] Master of Information Technology Security

10.5 Materials Science

10.5.1 Graduate faculty

UOIT

Yuri Bolshan, BSc, PhD

Dario Bonetta, BSc, MSc, PhD

Anatoli Chkrebtii, BSc, MSc, PhD

Hendrick de Haan, BSc, PhD

Jean-Paul Desaulniers, BSc, PhD

Brad Easton, BSc (Hons), PhD

Franco Gaspari, BSc, MSc, PhD

Brian Ikeda, BSc (Hons), MSc, PhD

Matthew Kaye, BASc, MSc, PhD

Brian MacLean, BSc, PhD

Fedor Naumkin, MSc, PhD

Remon Pop-Iliev, BSc, MASc, PhD, PEng

Ghaus Rizvi, BE, MS, MASc, PhD

William Smith, BASc, MSc, MASc, PhD, PEng

Isaac Tamblyn, BSc, PhD

Liliana Trevani, PhD

Trent University

Bill Atkinson (Associate Professor, Physics)

Ralph Shiell (Associate Professor, Physics)

Aaron Slepkov (Assistant Professor, Physics)

Rachel Wortis (Associate Professor, Physics)

Igor M. Svishchev (Professor, Chemistry)

Andrew J. Vreugdenhil (Associate Professor, Chemistry)

Suresh Narine (Professor, Physics and Chemistry)

10.5.2 Program information

The MSc and PhD programs in Materials Science are offered jointly by UOIT and Trent University. Materials Science is a broad multidisciplinary area of science that lies at the intersection of physics and chemistry. It comprises many sub-fields including nanotechnology, electronic materials, surface science, biomaterials and materials characterization.

An important goal of the Materials Science programs is to advance the understanding and prediction of the properties of matter. Such understanding facilitates the design of new materials with particular properties. The development of experimental and theoretical predictive tools applicable to size scales, ranging from the molecular to the macroscopic levels, is an integral component of the MSc and PhD in Materials Science programs. The programs provide both a broad and integrated overview of materials science and the opportunity for in-depth study of a particular problem emphasizing either theory or experimentation under the guidance of a research supervisor and a multi-disciplinary team of faculty from UOIT and Trent University.

The PhD program is comprised of four fields:

- Biomaterials
- Materials Chemistry
- Materials Physics
- Theoretical and Computational Materials Science

10.5.3 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, Materials Science applicants must meet the following program-specific requirements.

Master of Science in Materials Science

Hold an honours BSc degree in chemistry, physics or engineering, or hold equivalent qualifications as judged by the admissions committee. This committee is made up of the graduate program directors and one faculty member from each of the two universities. Prospective applicants must be well recommended and be accepted by a prospective supervisor who guarantees research assistant support for the duration of the student’s program.

Doctor of Philosophy in Materials Science

The minimum admission requirement for the PhD program is completion of an MSc-level degree in Materials Science, or related area, at a Canadian university or its equivalent.

Prior to being accepted into the program, PhD applicants must be accepted by a professor who is willing to act as a supervisor.

Under exceptional circumstances, MSc in Materials Science students may transfer directly to the PhD program after completing one academic year and their first progress report in the MSc program if the following conditions are met:

1. Completion of at least three courses in the master's program with at least an A-minus average.
2. Strong evidence of research ability as identified by the supervisory committee.
3. Approval of the direct transfer by the thesis supervisor(s) and the supervisory committee. The transfer must also be approved by the graduate program director and the Dean of Graduate Studies.

See Section 3.4.2.1 for additional information.

10.5.4 Part-time studies

Part-time studies are permitted on a case-by-case basis.

10.5.5 Degree requirements

10.5.5.1 Master of Science in Materials Science

The residency requirement of the university in which the student is registered must be satisfied. For UOIT's requirement, see Section 3.5.10.

The normal length of time for completion of the MSc is expected to be five semesters. A sixth semester may be needed to complete the thesis. Students are expected to complete the program in consecutive semesters. All program requirements must normally be completed on site at UOIT or at Trent University.

Students must successfully complete MTSC 6010G Physics and Chemistry of Materials, and MTSC 6020G Advanced Topics in Materials Science or MTSC 6140G Experimental Techniques in Materials Characterization. Each student must also attend and successfully complete the non-credit courses MTSC 6000G Graduate Seminar in Science Communication I and MTSC 6100G Graduate Seminar in Science Communication II in each fall and winter semester of the program.

In addition, at least two one-term courses acceptable for graduate credit must be completed with at least a B-minus (70 per cent) final grade in each course. Normally, courses taken for credit are those designated as graduate courses within the program. One of the four courses may be a fourth-year undergraduate course approved by the student's supervisor and the graduate program director.

The student must meet with his/her supervisory committee within the first six months of registration and subsequently at least once every six months. The committee consists of the student's research supervisor and at least two other faculty members in the program. Each supervisory committee must include at least one faculty member from each institution. While one meeting in a year must be a formal one, the other meeting may be held informally. In the latter case, in addition to the student and the supervisor, the meeting must involve at least one other member of the committee.

An acceptable thesis on a research topic must be submitted. Detailed specifications of the format of the thesis are available from the appropriate graduate office. Acceptance of the thesis requires the approval of an examining committee following an oral defence of the thesis.

Year 1

Semester 1

Two 3-credit courses, including MTSC 6010G Physics and Chemistry of Materials and one elective
MTSC 6000G Graduate Seminar in Science Communication I
Begin thesis research

Semester 2

Two 3-credit courses, including MTSC 6020G Advanced Topics in Materials Science, or MTSC 6140G Experimental Techniques in Materials Characterization, and one elective
MTSC 6100G Graduate Seminar in Science Communication II
Thesis research

Semester 3

Thesis research

Year 2

Semester 1

Thesis research and MTSC 6000G Graduate Seminar in Science Communication I

Semester 2

MTSC 6050G MSc Thesis and MTSC 6100G Graduate Seminar in Science Communication II

10.5.5.2 Doctor of Philosophy in Materials Science

Students in the PhD program must successfully complete MTSC 6010G Physics and Chemistry of Materials, and MTSC 6020G Advanced Topics in Materials Science or MTSC 6140G Experimental Techniques in Materials Characterization. In addition to these two core courses, students must attend and complete the two non-credit seminar courses MTSC 6000G Graduate Seminar in Science Communication I and MTSC 6100G Graduate Seminar in Science Communication II. Students must also pass the PhD candidacy examination (MTSC 7000G PhD Thesis Proposal and Candidacy Exam) and prepare and orally defend their doctoral dissertation (MTSC 7002G PhD Dissertation).

Depending on their previous academic work at the master's level, students may also be required to take courses in addition to those indicated above.

Each student's previous work will be assessed on a case-by-case basis. An individualized program of study will be designed and outlined in the student's letter of offer.

10.5.6 Course listing

MTSC 6000G Graduate Seminar in Science Communication I (non-credit)
MTSC 6100G Graduate Seminar in Science Communication II (non-credit)
MTSC 6010G Physics and Chemistry of Materials
MTSC 6020G Advanced Topics in Materials Science
MTSC 6050G MSc Thesis
MTSC 6110G Thermodynamics and Statistical Mechanics of Materials
MTSC 6140G Experimental Techniques in Materials Characterization
MTSC 6220G Advanced Photovoltaics and Solar Energy Physics
MTSC 6230G Physics of Non-Crystalline Materials
MTSC 6240G Biomaterials
MTSC 6260G Topics in Applied Materials Science I
MTSC 6270G Topics in Applied Materials Science II
MTSC 6330G Electrochemical Methods and Materials
MTSC 6510G Surface Science and Catalysis
MTSC 6520G Nanomaterials
MTSC 6530G Carbon Based Materials
MTSC 6610G Computational Physics (cross-listed with MCSC 6180G)
MTSC 6620G Theory of the Solid State
MTSC 6710G Computational Chemistry (cross-listed with MCSC 6170G)
MTSC 6720G Hydrogen Based Energy Systems and Fuel Cells
MTSC 6820G Polymer Science & Engineering
MTSC 7000G PhD Thesis Proposal and Candidacy Exam

MTSC 7001G PhD Research
MTSC 7002G PhD Dissertation
MTSC 7210G Advanced Topics in Materials Physics
MTSC 7310G Advanced Topics in Materials Chemistry
MTSC 7410G Advanced Topics in Computational Science
MTSC 7420G Advanced Topics in Theoretical Materials Science
MTSC 7510G Advanced Topics in Biomate

10.6 Modelling and Computational Science

10.6.1 Graduate faculty

Dhavide Aruliah, BSc, MSc, PhD

Peter Berg, DiplPhys, PhD

Sean Bohun, BSc, MSc, PhD

Jeremy Bradbury, BSc, MSc, PhD

Pietro-Luciano Buono, BSc, MSc, PhD

Anatoli Chkrebtii, BSc, MSc, PhD

Jason Cole, MSc, PhD

Christopher Collins, BSc, MSc, PhD

Hendrick de Haan, BSc, PhD

Mehran Ebrahimi, BEng, MSc, PhD

Mark Green, BSc, MSc, PhD

Huaxiong Huang, BSc, PhD

Salma Karray, PhD

William Langford, BSc, PhD

Greg Lewis, BSc, MSc, PhD

Fletcher Lu, BMath, MMath, PhD

Lixuan Lu, BES, MES, PhD

Fedor Naumkin, MSc, PhD

Eleodor Nichita, BSc, MSc, PhD

Ken Pu, BASc, MASc, PhD

Faisal Qureshi, BSc, MSc, PhD

William Smith, BASc, MSc, MASc, PhD, PEng

Mark Staley, BSc, MSc, PhD

Chirag Surti, MSc, PhD

Isaac Tamblyn, PhD

Lennaert van Veen, MSc, PhD

Anthony Waker, BSc, PhD

Ed Waller, BSc, MScE, PhD

10.6.2 Program information

Mathematical modelling is an important tool in the study of physical and biological phenomena. The field of computational science combines the implementation of mathematical models, computer algorithms and knowledge in a particular area of application in order to provide an additional tool for the study of phenomena and, in particular, to facilitate the study of problems that are intractable or difficult to study using other approaches. Mathematical models and computational science are powerful methods to study problems such as atmospheric phenomena; climate variability; molecular behaviour of matter; protein folding; option pricing in financial markets; and many other physical, biological, medical, environmental and economic problems.

The MSc and PhD programs in Modelling and Computational Science take advantage of the interdisciplinary nature of the Faculty of Science and collaborating faculties to offer students a program of study that introduces them to all aspects of the modelling process. UOIT's membership in the Shared Hierarchical Research Computer Network (SHARCNET) and advanced local computing infrastructure provides access to state-of-the-art computational facilities.

A survey of industrial experts undertaken by the Canadian Advanced Technology Alliance (CATA), the largest business development association dedicated to making Canadian organizations world-class producers and users of advanced technology, recently reported that there is a critical need for Highly Qualified

Personnel (HQP) who possess skills and knowledge in High-Performance Computing (HPC). Many companies from all sectors acknowledged this need for HQP, indicating the significant extent of the skill requirement. The jobs in these areas are expected to be almost exclusively within interdisciplinary groups that perform a number of different interrelated tasks. Thus, problem-solving ability and the ability to communicate and work with people from a variety of disciplines are critical. Graduates of the MSc and PhD programs are in an excellent position to fill these positions and to contribute to the province's and the country's economy. Depending on the background of the student, successful completion of the MSc in Modelling and Computational Science (in either the thesis or the course-based option) also prepares the student to enter PhD programs in applied mathematics, physics, chemistry and engineering. Graduates of the PhD program will have the possibility of continuing their career at the post-doctoral level and eventually obtaining an academic position in a unit corresponding to their research expertise. They will also be highly qualified to obtain positions as career scientists in a variety of institutions, whether at the governmental level or in the industrial, business or financial sectors.

The PhD program is comprised of two fields:

- Computational Physical Sciences
- Scientific Computing

10.6.3 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, Modelling and Computational Science applicants must meet the following program-specific requirements.

Master of Science in Modelling and Computational Science

Hold an honours undergraduate degree in mathematics, science or engineering. At a minimum, applicants must be acquainted with basic numerical methods, linear algebra, differential equations and possess some computing skills. To assist with the assessment of the application, applicants should submit detailed descriptions of any completed courses in these areas. Course descriptions should be copied from the university's academic calendar.

Admission depends on the availability of a research supervisor. Applicants should contact the potential supervisor and/or the graduate program director before formally applying.

Doctor of Philosophy in Modelling and Computational Science

The minimum admission requirement for the PhD program is completion of an MSc-level degree in science, engineering or a related area from a Canadian university or its equivalent.

Prior to being accepted into the program, PhD applicants must be accepted by a professor who specializes in their desired area of research and who is willing to act as a supervisor.

Under exceptional circumstances, MSc in Modelling and Computational Science students may transfer to the PhD program after completing one academic year in the MSc program if the following conditions are met:

1. Completion of a full master's program of course work (six courses worth a total of 18 credits), with at least an A-minus average.
2. Strong evidence of research ability.
3. Approval of the transfer by the research supervisor(s) and the supervisory committee. The transfer must also be approved by the graduate program director and the Dean of Graduate Studies.

See Section 3.4.2.1 for additional information.

10.6.4 Part-time studies

Part-time studies are permitted on a case-by-case basis.

10.6.5 Degree requirements

10.6.5.1 Master of Science in Modelling and Computational Science

The MSc degree program has two options:

- MSc thesis-based option, which consists of courses and a research thesis.
- MSc course-based option, which consists of courses and a research project.

For the MSc thesis-based option, students must successfully complete 30 credits, including five 3-credit courses and a 15-credit thesis. The five 3-credit courses must include three core courses and two elective courses, and a minimum grade of B-minus must be achieved in each course. No more than one elective course may be a fourth-year undergraduate course not included in the list of graduate course electives (see Section 10.6.6). All courses taken must be approved in advance by the student's supervisory committee. Students must also successfully complete the non-credit course MCSC 6000G Graduate Seminar in Modelling and Computational Science and the 15-credit MCSC 6001G MSc

Thesis. The latter is evaluated by an examining committee and involves an oral presentation.

For the MSc course-based option, students must successfully complete 30 credits, including eight 3-credit courses and the 6-credit MCSC 6002G MSc Research Project. The eight 3-credit courses must include three core courses and five elective courses, and a minimum grade of B-minus must be achieved in each course. No more than two elective courses may be fourth-year undergraduate courses not included in the list of graduate course electives (see Section 10.6.6). All courses taken must be approved in advance by the student's supervisory committee. In addition to the eight courses and the research project, students must also successfully complete the non-credit course MCSC 6000G Graduate Seminar in Modelling and Computational Science.

Suggested progression through program

Thesis option

Year 1

Semester 1
MCSC 6010G Mathematical Modelling
MCSC 6020G Numerical Analysis
One elective

Semester 2
MCSC 6030G High-Performance Computing
One elective

Semester 3
Thesis research

Year 2

Semester 1
Thesis research

Semester 2
MCSC 6001G MSc Thesis

Note: Required non-credit course in year two: MCSC 6000G Graduate Seminar in Modelling and Computational Science.

Course-based option

Year 1

Semester 1
MCSC 6010G Mathematical Modelling
MCSC 6020G Numerical Analysis
One elective

Semester 2
MCSC 6030G High-Performance Computing
Two electives

Semester 3
MCSC 6002G MSc Research Project

Year 2

Semester 1
Two electives
Research project

Semester 2
MCSC 6002G MSc Research Project

10.6.5.2 Doctor of Philosophy in Modelling and Computational Science

Students in the PhD program must successfully complete eight courses including MCSC 6010G Mathematical Modelling, MCSC 6020G Numerical Analysis and MCSC 6030G High-Performance Computing. These three core courses comprise the breadth requirement.

As part of the residency requirement, four of the eight courses must be taken at UOIT. Two of the eight courses must be 7000-level courses.

Students must also successfully complete MCSC 7000G Modelling and Computational Science Professional Skills, pass the PhD candidacy examination (MCSC 7001G PhD Thesis Proposal and Candidacy Exam) and prepare and orally defend their doctoral dissertation (MCSC 7003G PhD Dissertation).

10.6.6 Course listing

Core courses

MCSC 6000G Graduate Seminar in Modelling and Computational Science
MCSC 6001G MSc Thesis
MCSC 6002G MSc Research Project
MCSC 6010G Mathematical Modelling
MCSC 6020G Numerical Analysis
MCSC 6030G High-Performance Computing
MCSC 7000G Modelling and Computational Science Professional Skills
MCSC 7001G PhD Thesis Proposal and Candidacy Exam
MCSC 7002G PhD Research
MCSC 7003G PhD Dissertation

Graduate elective courses

MCSC 6060G Advanced Statistical Mechanics (cross-listed with PHY 4010)
MCSC 6070G Advanced Quantum Mechanics (cross-listed with PHY 4020)
MCSC 6120G Numerical Methods for Ordinary Differential Equations
MCSC 6125G Numerical Methods for Partial Differential Equations
MCSC 6140G Dynamical Systems and Bifurcations
MCSC 6150G Fluid Dynamics
MCSC 6160G Transport Theory
MCSC 6165G Monte Carlo Methods (cross-listed with NUCL 5040G)
MCSC 6170G Computational Chemistry (cross-listed with MTSC 6710G)
MCSC 6180G Computational Physics (cross-listed with MTSC 6610G)
MCSC 6210G Advanced Topics in Mathematical Modelling
MCSC 6220G Advanced Topics in Numerical Analysis
MCSC 6230G Advanced Topics in High-Performance Computing
MCSC 6240G Advanced Topics in Dynamical Systems
MCSC 6280G Advanced Topics in Computational Science
MCSC 7210G Advanced Topics in Mathematical Modelling
MCSC 7220G Advanced Topics in Numerical Analysis
MCSC 7230G Advanced Topics in High-Performance Computing
MCSC 7240G Advanced Topics in Dynamical Systems
MCSC 7250G Advanced Topics in Fluid Dynamics
MCSC 7270G Advanced Topics in Industrial Mathematics: Case Studies
MCSC 7280G Advanced Topics in Computational Science

Section 11: Graduate Programs Offered by the Faculty of Social Science and Humanities

11.1 Contact information

Faculty of Social Science and Humanities
University of Ontario Institute of Technology (UOIT)
55 Bond Street
Oshawa, Ontario L1G 1B1
Canada

905.721.3234
905.721.3372 (fax)
ma.crim@uoit.ca
socialscienceandhumanities.uoit.ca

11.2 Graduate degree offered

Master of Arts (MA) in Criminology

11.3 Graduate faculty

Shahid Alvi, BA, MA, PhD

Nawal Ammar, BSc (Hons), MSc, PhD

Rachel Ariss, BA, LLB, LLM, SJD

Sasha Baglay, BA MPA, PhD

Liqun Cao, MA, PhD

Carla Cesaroni, BA, MA, PhD

Kimberley Clow, BA, MA, PhD

Wesley Crichlow, BA (Hons), MEd, PhD

Brian Cutler, BA, MA, PhD

Aziz Douai, BA, MA, PhD

Steven Downing, BA, MS, PhD

Joseph Eastwood, BA, MSc, PhD

Karla Emeno, BSc, MA, PhD

Gary Genosko, BA, MA, PhD

Judith Grant, BA, MA, PhD

Leigh Harkins, BSc, MA, PhD

Ronald Hinch, BA, MA, PhD

Amy Leach, BA, MA, PhD

Tanner Mirrlees, BA, MA, PhD

Isabel Pedersen, BA, MA, PhD

Barbara Perry, BA, MA, PhD

Rosemary Ricciardelli, BA, MA, PhD

Hannah Scott, BA, MA, PhD

Matthew Shane, BA, MA, PhD

Phillip Shon, BA, MA, MA, PhD

Andrea Slane, BA, PhD, JD

Arshia Zaidi, BA, MA, PhD

11.4 Program information

The MA in Criminology program provides students with a solid foundation of advanced knowledge in criminological theory, sophisticated research methodologies, complex quantitative and qualitative applications, and contemporary substantive issues in criminology. Specifically, the MA program seeks to provide students with an in-depth and broad understanding of contemporary criminological issues and debates, as well as the critical thinking and practical skills necessary to conduct criminological research in the public and private sectors. This includes, but is not limited to, public policy agencies, social services, and government and non-government organizations. The program trains both mid-career and pre-career students for careers in analysis and research in criminal justice agency settings. It also prepares students for advanced graduate work in criminology at the doctoral level.

Special emphasis in the MA program is placed on the study of two fields:

- Cybercrime
- Inequality and Crime

The requirement that students learn and apply both quantitative and qualitative research skills is also unique to this program.

11.5 Admission requirements

In addition to the general admission requirements for graduate studies at UOIT described in Section 3.4.2, MA in Criminology applicants must meet the following program-specific requirements:

Hold an undergraduate honours degree in the social sciences from a Canadian university, or its equivalent from a recognized institution. Normally, applicants are expected to have graduated with a social science degree which has provided them with a sound understanding of social science methodologies and a basic understanding of criminological theories.

Applicants are required to submit a portfolio consisting of the following documentation:

- A curriculum vitae (CV) including the applicant's education, employment, teaching and research experience, and publications (if any).
- A sample of scholarly writing from a previous undergraduate course (up to 20 pages, double-spaced, one-sided documents only).
- A third letter of recommendation from an academic or non-academic source.

11.6 Part-time studies

The MA program is intended to be a full-time program, but a small number of part-time students may be admitted each year to increase its accessibility.

11.7 Degree requirements

The MA program has two options: a non-thesis option consisting of eight courses and a major paper, and a thesis option consisting of six courses and a thesis. Both options of the degree program require a total of 30 credit hours. Graduate students in both the non-thesis and thesis programs should be able to complete their studies in approximately 24 months of full-time study. The policies and procedures for theses and major papers may be consulted in Section 3.8.

Students in the thesis option take one additional reading or special topics elective course and develop a thesis. The potential thesis topic is to be selected and approved in consultation with the candidate's research supervisor and supervisory committee. Once the thesis has been completed, students undergo an oral examination to defend their theses. The thesis is defended before the supervisory committee and one external examiner.

Proposed progression through program

Thesis option

Year 1

Semester 1
SSCI 5010G Data Analysis 1 – Graduate
SSCI 5060G Advanced Methods in Qualitative Research

Semester 2
SSCI 5020G Criminological Theory
SSCI 5050G Professional Seminar
SSCI 5100G Graduate Seminar on Contemporary Issues in Criminology

Semester 3
SSCI 5002G MA Thesis in Criminology

Year 2

Semester 1
SSCI 5200G Graduate Seminar in Inequality and Crime, or
SSCI 5300G Cybercrime and Criminology, or
SSCI 5400G Special Topics in Criminology

Semester 2
SSCI 5002G MA Thesis in Criminology

Non-thesis option

Year 1

Semester 1
SSCI 5010G Data Analysis 1 – Graduate
SSCI 5060G Advanced Methods in Qualitative Research

Semester 2
SSCI 5020G Criminological Theory
SSCI 5050G Professional Seminar
SSCI 5100G Graduate Seminar on Contemporary Issues in Criminology

Semester 3
SSCI 5001G Major Paper in Criminology

Year 2

Semester 1
SSCI 5200G Graduate Seminar in Inequality and Crime, or
SSCI 5300G Cybercrime and Criminology, or
SSCI 5400G Special Topics in Criminology

Semester 2
Two reading and/or elective courses

Semester 3
SSCI 5001G Major Paper in Criminology

11.8 Course listing

Core courses
SSCI 5001G Major Paper in Criminology (non-thesis option)
SSCI 5002G MA Thesis in Criminology (thesis option)
SSCI 5010G Data Analysis 1 – Graduate
SSCI 5020G Criminological Theory
SSCI 5050G Professional Seminar
SSCI 5060G Advanced Methods in Qualitative Research
SSCI 5100G Graduate Seminar on Contemporary Issues in Criminology

Elective courses
SSCI 5015G Data Analysis 2 - Graduate
SSCI 5200G Graduate Seminar in Inequality and Crime
SSCI 5300G Cybercrime and Criminology
SSCI 5400G Special Topics in Criminology
SSCI 5500G Reading Course

Designated undergraduate electives for the fields of Cybercrime, and Inequality and Crime
SSCI 4000 Advanced Justice Studies
SSCI 4010 Policy Development
SSCI 4032 Theory and Practice of Mediation

Note: Course descriptions for the undergraduate courses listed can be found in the 2014-2015 Undergraduate Academic Calendar and Course Catalogue located on the UOIT website at **uoit.ca**.

Section 12: Graduate Course Descriptions

In some programs, students may, with the approval of the graduate program director, be allowed to take senior undergraduate courses to apply to graduate degree requirements. Descriptions of these undergraduate courses are available in the 2014-2015 Undergraduate Academic Calendar and Course Catalogue located on the UOIT website at **uoit.ca**.

Please note: not all courses will be offered each year.

APBS 6010G Research in Applied Bioscience. This is a required team-taught course designed to provide a foundation for the graduate program in Applied Bioscience. The course provides students with current background knowledge and skills needed for research in applied bioscience and exposes students to current issues and problems that this area of research may target. The course introduces such topics as principles of experimental design, data interpretation and analysis of results, and how to present and communicate scientific information in both oral and written formats. Students also learn about the grant and scholarship process and how to write a research proposal. They are also introduced to such issues as research ethics and intellectual property. 3 cr. Prerequisite: enrolment in the APBS graduate program.

APBS 6020G MSc Thesis in Applied Bioscience. Students must prepare and successfully defend a written thesis related to their supervised research project at the end of the program. The student's supervisory committee must approve the commencement of the writing of the thesis. The thesis is evaluated by an examining committee and accompanied by an oral presentation. The student must receive a satisfactory report on the written thesis and must demonstrate a thorough understanding of the research topic. The student receives a grade of either pass or fail. 21 cr. Prerequisite: good standing in the APBS graduate program.

APBS 6030G Seminar in Applied Bioscience. This course requires students to present a thorough overview of their thesis research, including relevant background material, and research results and their interpretation. The presentation is expected to be appropriate for an interdisciplinary audience in science. This is a required, non-credit course in the Applied Bioscience program. Seminars are focused on specific research projects in applied bioscience. Student seminars are regularly scheduled as needed. The student receives a grade of either pass or fail. 0 cr. Prerequisite: good standing in the APBS graduate program.

APBS 6100G Advanced Cell and Molecular Biology. This is a non-lecture based course where students and the faculty coordinator discuss current research in cell and molecular biology. The course is a combination of group discussions and presentations.

Each week a student presents either a research article or a synopsis of the current knowledge regarding a topic related to the course and possibly his/her own research interests. This allows the student to apply basic concepts learned as an undergraduate student to the current state of knowledge in cell and molecular biology. 3 cr. Prerequisite or corequisite: enrolment in the APBS graduate program.

APBS 6200G Environmental Determinants of Health. This course explores interactions between environment and human health. It comprehensively addresses principles of environmental health followed by specific issues regarding harmful environmental agents and Canadian and global environmental health challenges. It is designed to be delivered by an interdisciplinary faculty team, potentially including members from the faculties of Health Sciences, Science, Social Science and Humanities, and Engineering and Applied Science. It attracts health and non-health graduate students interested in the multifactorial nature of environmental diseases. At the end of this course, students should have a broad understanding of how human health is contextually determined by our environment and be familiar with published seminal environmental health research. This course is cross-listed with HLSC 5314G Environmental Determinants of Health. 3 cr. Prerequisite or corequisite: enrolment in the APBS graduate program.

APBS 6300G Advanced Topics in Biological Chemistry. This graduate course explores a range of research topics at the intersection of chemistry and biology through examples selected from the current scientific literature. Topics include protein engineering, enzymes, receptors, cofactors, enzymes for organic synthesis, biotransformations, catalytic properties of nucleic acids and bio-inorganic chemistry. 3 cr. Prerequisite or corequisite: enrolment in the APBS graduate program.

APBS 6400G Advanced Topics in Forensic Bioscience. This graduate course explores a range of research topics at the intersection of biology, chemistry and forensic science through examples selected from the current scientific literature and available casework. The course focuses on current and new developments in biotechnology and bioanalytical techniques associated with forensic analysis, quality assurance concepts and the use of scientific evidence in court. 3 cr. Prerequisite: enrolment in the Forensic Bioscience field in the APBS graduate program.

APBS 6500G Advanced Topics in Medicinal Chemistry. This course explores topics in the drug discovery process from the discovery of lead molecular candidates to their optimization as drug candidates. Topics include natural products drug discovery, combinatorial chemistry and medicinal synthetic organic chemistry. This course is cross-listed with CHEM 4510U. 3 cr. Prerequisite: enrolment in the APBS graduate program.

APBS 7040G PhD Thesis Proposal and Candidacy Exam. Students in the Applied Bioscience PhD program are required to submit a comprehensive thesis proposal outlining their research objectives and proposed methodology. This thesis proposal also consists of a literature review that addresses the current state of knowledge of the particular research topic. This course consists of an oral qualifying exam that evaluates the students' grasp of the literature and their particular research plan. Topics in this course vary with students' specific research projects. This non-credit course is evaluated on a pass/fail basis. 0 cr. Prerequisite: enrolment in the Applied Bioscience PhD program.

APBS 7050G Research Seminar in Applied Bioscience. This course requires students at the end of their program to present a thorough overview of their thesis research, including relevant background material, research results and their interpretation. This seminar must address how the research will benefit society. The presentation is expected to be appropriate for an interdisciplinary audience in science. This course is a part of the regular seminar series in Applied Bioscience. Therefore, students are also expected to give yearly seminars that provide an update on the progress of their research and provide peer-reviewed feedback on seminars of fellow students. Students are expected to be present at all other seminars. The final grade will be administered at the end of their final seminar. 3 cr.

APBS 7060G PhD Research. This is a non-credit course that is administered by the student's supervisor. Students in the course are required to make satisfactory progress in their research, keep up to date with the literature on the current state of knowledge in their particular area of research and provide regular updates on their progress to their advisor. Students who make satisfactory progress with their thesis research are able to continue in the program and enrol in this course the following year. Students are required to register for this course every year. 0 cr. Prerequisite: good standing in the APBS PhD program.

APBS 7070G PhD Dissertation. The dissertation is the primary component of the PhD degree requirements. The student's research must lead to an original contribution of knowledge in the field, which must be reported fully in the candidate's dissertation. The research is carried out under the direction of the candidate's supervisor or co-supervisors in co-operation with a supervisory committee. This thesis is accompanied by an oral thesis defence. 40 cr. Prerequisite: good standing in the APBS PhD program.

APBS 7100G Special Topics in Biomolecular Science. This course requires students to research and present orally a thorough overview of the current state of knowledge on a particular topic related to biomolecular science. The students should also be able to identify key gaps in knowledge. This seminar must address how advances in the related area of research will benefit society. The presentation is expected to be appropriate for

an interdisciplinary audience in science. 3 cr. Prerequisite: enrolment in the Biomolecular Science field in the APBS program.

APBS 7200G Special Topics in Ecosystem Health. This course requires students to research and present orally a thorough overview of the current state of knowledge on a particular topic related to ecosystem health. The students should also be able to identify key gaps in knowledge. This seminar must address how advances in the related area of research will benefit society. The presentation is expected to be appropriate for an interdisciplinary audience in science. 3 cr. Prerequisite: enrolment in the Ecosystem Health field in the APBS program.

APBS 7300G Special Topics in Forensic Bioscience. This course requires students to research and present orally a thorough overview of the current state of knowledge on a particular topic related to forensic bioscience. The students should also be able to identify key gaps in knowledge. This seminar must address how advances in the related area of research will benefit society. The presentation is expected to be appropriate for an interdisciplinary audience in science. 3 cr. Prerequisite: enrolment in the Forensic Bioscience field in the APBS program.

APBS 7400G Special Topics in Human Health Biology. This course will require students to research and present orally a thorough overview of the current state of knowledge on a particular topic related to human health biology. The students should also be able to identify key gaps in knowledge. This seminar must address how advances in the related area of research will benefit society. The presentation will be expected to be appropriate for an interdisciplinary audience in science. 3 cr. Prerequisite: enrolment in the Human Health Biology field in the Applied Bioscience MSc/PhD program.

BUSI 5000G Business Communication. Business Communication is a practical skills course in which students practice techniques to achieve effective communication through different modes, negotiation, building collaborative relationships and fostering understanding in a diverse workplace. These skills form the basis for the communication techniques required and further developed throughout the program. 1 cr. 4 day workshop.

BUSI 5010G Foundations of Business. This course provides managers with an overview of the economic environment within which business must operate. Key concepts and ideas from microeconomics, macroeconomics and international economics are developed so that managers understand the economic forces that affect the operation of business entities and the impact of change in the economic environment on the strategic direction of the firm. 3 cr.

BUSI 5020G Ethics and Leadership. This course examines the legal, moral and ethical aspects of business decisions and practices. Topics studied include corporate responsibility; corporate governance; environmental sustainability; and ethics in marketing, accounting, human resources, and information communication and technology. Leadership studies how executives motivate others to work towards team objectives. Theories of leadership such as trait, behavioural, participative, situational, contingency, transactional and transformational are examined as well as practices of outstanding leadership. A personal plan for leadership development is created. 3 cr.

BUSI 5100G Accounting Systems. This course provides an overview of financial and managerial accounting. The first part of the course develops students' ability to read, understand and use corporate financial statements. The course focuses on the user of MBA financial accounting data (rather than the preparer). The second part of the course examines the concepts and tools of managerial accounting. The course covers alternative costing methods and illustrates how the resulting cost information can be used for decision making and examines the role of the internal accounting system in evaluating managerial performance and in coordinating the activities within a firm. 3 cr.

BUSI 5200G Marketing Management. The Marketing Management course is designed to offer a broad overview of the fundamental areas in the marketing process. The approach is a blend of theory and practical application which permits immediate implementation in the workplace. The topics covered in the course include marketing planning; segmentation and positioning; and devising strategies for new products, appropriate pricing, marketing communications and distribution. The format includes world-class marketing lectures and case studies resulting in a lively, participatory environment for a maximized learning experience. 3 cr.

BUSI 5300G Organizational Behaviour. This course provides students with an understanding of the fundamentals of organizational behaviour and their application to human resources management. It focuses on the management aspects of organizational behaviour to create an environment that is conducive to maximum productivity. Topics include group dynamics, organization structure, change management and organizational design. 3 cr.

BUSI 5400G Quantitative Analysis in Business. This course provides an overview of business statistics. Topics include descriptive statistics, probability, sampling distributions, confidence intervals, inference, regressions and correlation. Students select topics that best match their area of focus (such as in marketing, finance and supply chain management) for two extended case assignments. All exercises draw on numerous real data sets. 3 cr.

BUSI 5410G Financial Management. This course is an overview of corporate finance. Students in this course will develop skills in understanding financial systems and analysing financial decisions within the firm. Topics covered are financial statement analysis and ratios, time valuation of money, capital budgeting, financial markets, valuation of stocks and bonds, financial risk, cost of capital, financial leverage, dividend policy, and options and futures. 3 cr. Prerequisites: BUSI 5010G and BUSI 5100G.

BUSI 5420G Discrete Event Simulation Modeling. This course will provide an introduction to the application and theoretical background of systems simulation. Topics include systems concepts, modeling systems using discrete events and the modeling of operations and logistics systems, service systems and healthcare systems through simulation. Theoretical topics include random variable generation, model verification and validation, statistical analysis of output, variance reduction techniques and optimization via simulation. This course will blend systems modeling and simulation experimental design and analysis. Simple simulation problems will be introduced using Microsoft Excel and a high-level simulation language will be utilized for more complex problems. Students will complete and present a simulation project. This subject matter will be examined using primarily a case-based, investigation-style teaching method to encourage interaction, participation and a personal sense of the subject matter. Lectures are coupled with hands-on cases and discussion to facilitate the understanding of the concepts of the course and demonstrate their application to real-life situations. Students will be encouraged to present their ideas and bring forward emerging issues in the application and information systems in the workplace. 3 cr.

BUSI 5450G Business Forecasting Techniques. This course examines the theory and application of major forecasting techniques and methods used in marketing, economics, operations management and other functional areas of business. Simple and multiple regression models are studied, followed by time series methods of smoothing, seasonal decomposition, econometrics and Box-Jenkins ARIMA modelling. After introducing simulation methods and forecasting expert systems, the course addresses important issues of model validation, selection and control in a business context as well as prediction confidence intervals. 3 cr.

BUSI 5500G Management Information Systems. This course provides the knowledge of management frameworks and analytical tools to understand the economic and strategic implications of information systems (IS) for supporting intra- or inter-enterprise business processes. The course also explores emerging IS-driven business applications such as supply chain management (SCM), customer relationship management (CRM) and enterprise resource planning (ERP) to meet organizational objectives and foster competitive advantages from both managerial and technical perspectives. 3 cr. Prerequisites: BUSI 5100G and BUSI 5400G, or permission from the instructor.

BUSI 5510G E-Commerce Strategies. This course provides the knowledge of electronic commerce (E-Commerce) strategies for supporting any form of economic activities between business partners via electronic communication networks (e.g., Internet, Intranet, Extranet). The course explores the strategies which encompass organizations' internal operations and policies from both managerial and technical perspectives. The course also discusses the emerging applications of business services networks (BSN) and business process management (BPM). 3 cr.

BUSI 5600G Operations and Project Management. Operations and Project Management develops methods to manage resources efficiently within scope, time and cost constraints. For ongoing operations, the effective and efficient management of the production and distribution process, including delivery of services, is studied. Specialized topics include procurement, quality management, logistics, critical path analysis (PERT) and budgeting. 3 cr. Prerequisite: BUSI 5400G.

BUSI 5610G Knowledge Discovery and Data Mining. Many diverse domains are generating ever-increasing volumes of data necessitating the use of advanced computing techniques to automate the translation of data to information and ultimately to knowledge. The discovery of new knowledge through the use of various data mining techniques on real-world datasets and the current research directions represents the foundation context for this course. This course will explore topics in foundations of knowledge discovery and data mining; data mining approaches; and the application of data mining within such diverse domains as healthcare, business, supply chain and IT security. Current research directions, trends, issues and challenges are also explored. 3 cr.

BUSI 5640G Optimization. This introductory course in optimization covers structure and classification of optimization problems, branch-and-bound algorithms, linear optimization models, linear programming including geometric interpretations, basic solutions, the simplex method, cutting plane algorithms and network optimization. Students will use various software packages to apply the optimization techniques to inventory and project management problems. 3 cr. Prerequisite: an appropriate background in mathematics and permission from the instructor.

BUSI 5650G Supply Chain Management. This introductory course in Supply Chain Management covers the following topics: supply chain activities and functions, the role of purchasing in the supply chain, the purchasing process, purchasing and information technology, sourcing strategies, electronic marketplaces and e-procurement, negotiating techniques, quality considerations in purchasing, outsourcing and supplier price determination. 3 cr.

BUSI 5700G Entrepreneurship. Entrepreneurship is studied from the perspective of the established organization and for start-up entities. Issues studied include creating a business plan, sources of capital, types of financing, valuation of the firm, managing change, managing for creativity, organizational renewal, creating and sustaining competitive advantage and how to encourage or obstruct innovation. 3 cr.

BUSI 5710G Strategic Information Technology Management. Information technology (IT) has the potential to change the landscape of global competition, increase productivity, change industry structure, make markets more efficient and alter a firm's competitive position. IT can increase the efficiency of every business activity including product design, production, purchasing, marketing, customer-supplier relationships and human resource management. Economists agree that IT has contributed significantly to productivity growth and helped check inflation. Such beliefs and promises have persuaded corporations to spend over a trillion dollars on IT alone over the last decades. However, the dramatic decline in IT investments after 2000–2001 and the difficulty researchers have had in tying IT investments to corporate performance has led sceptics to question the economic contribution of IT. Indeed, the rapid rate of IT innovation, massive investments in the IT infrastructure and applications, the difficulty in showing the competitive impact of IT investments and conflicting viewpoints regarding the value of IT raise a gamut of issues for managers in user organizations, financial institutions, vendor organizations and consulting firms: Do IT and the Internet change basic economic principles and strategies? Does the ability to search, seek and share information regardless of time, space and geographical differences increase market efficiency? Is such efficiency beneficial to all market participants? How and where can IT benefit an organization? Are there any killer applications that can still justify large investments in IT infrastructure? Which types of information technologies hold promise for the future? This course has been designed to provide frameworks and underlying principles to address these and other related issues. 3 cr. Prerequisite: BUSI 5500G.

BUSI 5800G International Business. This course provides students with an overview of the international business environment. Topics include globalization, international trade, regional economic integration, global competition, foreign direct investment and global capital markets. 3 cr. Prerequisite: BUSI 5010G.

BUSI 6090G Special Topics in Business. This course is a special topics course chosen from one of the following areas: marketing, finance, management, international business or e-commerce. 3 cr. Prerequisite: permission from the instructor.

BUSI 6210G Consumer Behaviour. This course applies knowledge from areas such as psychology, sociology and anthropology to describe and understand how consumers select, purchase, use and dispose products and why. Basic concepts and theories in

consumer behaviour are applied through in-class discussions and real-world marketing situations. 3 cr. Prerequisite: BUSI 5200G or permission from the instructor.

BUSI 6220G Marketing Strategy. This course focuses on strategic planning and evaluation of marketing decisions in a competitive environment. The purpose of the course is to help students develop analytical abilities by integrating all major areas of marketing. Special emphasis is placed on problem solving and decision making in the formulation of marketing strategies. 3 cr. Prerequisite: BUSI 5200G.

BUSI 6230G Internet Marketing. This course is designed as an introduction to the rapidly changing world of Internet marketing. The opportunities, problems and strategies associated with incorporating the Internet medium into the marketing function are examined. The topics covered include the importance of website traffic and brand building, online customer support and data collection, online pricing tactics and Internet marketing models. Marketing issues facing Internet start-ups and established online firms will also be discussed. 3 cr. Prerequisite: BUSI 5200G.

BUSI 6250G Global Marketing. This advanced course provides further experience in applying marketing concepts, analyses and tools to the distinctive challenges of formulating and implementing international marketing programs. Topics will include an examination of the impact of the international environment on marketing decisions, international pricing and promotion, market entry and penetration strategies, and how to organize international marketing operations for maximum effectiveness. 3 cr. Prerequisite: BUSI 5200G.

BUSI 6260G Marketing Research. This course familiarizes students with marketing research scope and techniques. Upon completing this course, students are expected to know how to gather and analyze information to make marketing decisions. 3 cr. Prerequisite: BUSI 5200G.

BUSI 6410G Global Finance. This course examines the impact of global finance on the corporation. The management of currency risk with different financial instruments and interfacing with diverse sovereign institutions is studied. Foreign investment and financing are also explored. 3 cr. Prerequisite or corequisite: BUSI 5410G.

BUSI 6420G Equity Securities. This course studies equity assets with a variable income stream. Students learn valuation models of fundamental analysis including single growth, H-model, and multistage growth of dividends; residual income and free cash flows; and technical analysis. Other factors such as the business cycle, stock market outlook and industry environment are considered in the analysis process. 3 cr. Prerequisite: BUSI 5410G.

BUSI 6430G Fixed Income Securities. This course studies fixed income securities from the viewpoint of investors, including individuals and institutions. Different sectors of fixed incomes such as corporate, government, mortgage-backs and other asset-backs are examined for valuation and risk exposure. 3 cr. Prerequisite: BUSI 5410G.

BUSI 6440G Derivative Strategies. This course is an overview of derivative instruments and strategies. Students in this course will develop skills in the valuation of derivatives and strategies employing derivatives. Topics covered are futures markets and valuations, options market and valuation, option strategies, swaps and option sensitivities. 3 cr. Prerequisite: BUSI 5410G.

BUSI 6450G Portfolio Management. This course studies how portfolios are managed from the viewpoint of running a hedge fund, mutual fund and other financial institution. Strategies employed to achieve portfolio goals will include investments from equities, fixed income, real estate and commodities. 3 cr. Prerequisite: BUSI 5410G.

BUSI 6630G Inventory and Logistics in Supply Chain Management. Logistics is the area of the supply chain that deals directly with customers and customer satisfaction. This course looks at the strategic role of inventory management, key strategic drivers of uncertainty in the supply and demand of products, and the tools and techniques for inventory analysis. The course emphasizes issues which are critical to supply chain performance as perceived by the customer, including finished goods inventory planning; transportation industry cost and performance structure; and other third party logistics services, especially warehousing, information technology and integrated logistics services. Students also study the order fulfillment process and the role of internal supply chain functions, measurement issues and practices in the supply chain, transportation cost drivers and structure of the transportation industry, other cost drivers within the supply chain and current and best practices in logistics. 3 cr. Prerequisite: BUSI 5400G and BUSI 5600G.

BUSI 6650G Advanced Supply Chain Management. This course covers the strategic role of the supply chain, key strategic drivers of supply chain performance and the tools and techniques for supply chain analysis. The course presents management practices at the forefront of supply chain management and information technology in the supply chain. Students study the impact of technology on supply chain operations and the development of products and services. The course examines the current practices and future technological directions in supply chain management and business strategy, and provides innovative ideas about integrating new technologies into operations, technology-based product and service development, and knowledge management and supply chain integration issues. 3 cr. Prerequisite: BUSI 5650G. Corequisite: BUSI 5640G.

BUSI 6660G Impact of Technology on the Supply Chain. This course examines the impact of technology, information systems and e-commerce on supply chain management. The course will consider the impact of advanced manufacturing and inventory management systems, the impact of the Internet on supply chain coordination and procurement, EDI, RFID, inter-organizational systems, ERP integration across the supply chain, data management and security issues for Internet transactions, and the impact of international legal requirements on supply chain systems integration. 3 cr. Prerequisites: BUSI 5500G and BUSI 5600G.

BUSI 6700G Strategic Management. This course examines strategy and related concepts. The focus throughout is on strategic management: choosing and defining purposes and objectives, formulating and implementing a viable strategy and monitoring strategic performance. The thrust of the course is to view the organization in its totality; the external environment in which it operates, its strategy and its internal administrative activities. Topics include the strategic process, the role of the general manager, the external environment, internal analysis, competitive advantage, strategy and structure, diversification, integrations and alliances, organizational structure, strategy and control, corporate strategy and practical analytical skills that can be used to improve strategic decision making. 3 cr. Prerequisite: completion of semesters one and two of the MBA program.

BUSI 6810G Global Management. This course examines the dimensions of business management in foreign countries. The course provides a framework for analyzing managerial issues and problems faced by management as a result of economic, cultural, political and social differences within the global environment. 3 cr. Prerequisite: BUSI 5800G.

BUSI 6920G MBA Research Project I. This course provides students with an opportunity to gather knowledge and skills learned from the program coursework and to conduct a research project with industry applications. Students are expected to do a research literature review and to develop a set of hypotheses for a research project in their area of concentration. A research proposal outlining hypotheses and alternative remedies to the problem should be submitted to the research faculty advisor and graduate program director by the end of the course semester. The student will receive a grade of either pass or fail. 3 cr. Prerequisite: completion of all core program requirements and three field courses.

BUSI 6930G MBA Research Project II. This course is a continuation of the MBA Research Project I. Students in this course are required to make satisfactory progress in their research and provide regular updates on their progress to their advisor. This course may be taken concurrently with BUSI 6940G MBA Research Project III with permission of the graduate program director. The student will receive a grade of either

pass or fail. 3 cr. Prerequisite: BUSI 6920G or special permission of the graduate program director.

BUSI 6940G MBA Research Project III. The research outlined in the BUSI 6920G proposal should be completed during this course. The final report of the research findings and recommendations for the problem addressed should be submitted to the research faculty advisor and graduate program director. A presentation of the research findings is required at the completion of the course. The results should have direct, practical applications and/or be publishable in refereed publications. The student will receive a grade of either pass or fail. 3 cr. Prerequisite: BUSI 6930G, or permission of the graduate program director, and completion of all other program requirements.

CSCI 5001G MSc Thesis. Students must prepare and successfully defend a written thesis related to their supervised research project at the end of the program. The student's supervisory committee must approve the commencement of the writing of the thesis. The thesis will be evaluated by an examining committee and accompanied by an oral presentation. The student must receive a satisfactory report on the written thesis and must demonstrate a thorough understanding of the research topic. The student will receive a grade of either pass or fail. 15 cr. Prerequisite: enrolment in the MSc in Computer Science program.

CSCI 5010G Survey of Computer Science. This course is a survey of some of the main topics in computer science. Topics covered vary from year to year and may include digital media, computer graphics, human-computer interaction, digital design, computer networks, security, computer architecture, health informatics and system design. This course is team taught by experts in the topics covered. 3 cr.

CSCI 5020G Collaborative Design and Research. In this course, small groups of students from different disciplines work together on a series of design and research projects. Through a series of small but realistic projects, students develop their research and collaboration skills. Topics include research and design methodologies, structure and management of multidisciplinary design and research teams, and research and design problems selected by the instructors. 3 cr.

CSCI 5030G Automata and Applications. This course studies the theories of various types of automata and their applications. Regular automata, Büchi automata, pushdown automata and finally tree automata are covered. Students discuss the respective formal languages and the fundamental theorems such as closure theorems and different versions of Nerode equivalences. The second part of the course discusses the applications of automata in selected areas of compilers, natural language processing, information retrieval, type checking of programs, composition of services and temporal

logic reasoning. 3 cr. Prerequisites: undergraduate courses in Discrete Mathematics, Algebra and Computational Complexity.

CSCI 5040G Epistemology of Science. What is science? How does science work? Where does science begin and end? Which kinds of activity count as "science"? Does science tell us what the world is "really" like? Is science our only sure path to respectable "knowledge"? What makes it different from other ways of understanding the universe? What is knowledge? How is knowledge formed and by whom? In this course, which aims to be an accessible introduction to the philosophy of science, answers to these and many other questions are sought. Topics considered include positivism, inductivism, contextualism, scientific realism and "scientific revolution," as well as the views of Socrates, Bacon, Descartes, Toulmin, Popper, Kuhn and Feyerabend, among numerous others. The major issue under discussion in this course is that of the impact of beliefs regarding the nature of science and how the world is thought to work. Implications for learning science in online environments are explored. 3 cr.

CSCI 5100G Development of Concurrent Software. This course is an introductory course to software development for concurrent software with an emphasis on design, implementation and verification. Topics in the design and implementation of concurrent software include design patterns for concurrency, programming with threads and programming in coordination languages. Topics in the verification of concurrent software include static analysis, model checking and testing. 3 cr. Prerequisites: undergraduate courses in Software Engineering (required) and Concurrent Programming (recommended).

CSCI 5110G Network Computing. This course teaches how to design and implement loosely coupled distributed systems. It presents hands-on experience as well as theoretical background in network computing models and design principles. Topics in scalability, performance, security, resource specification and discovery, naming and indexing, and resource management for distributed systems will be discussed in the context of network computing paradigms like publish/subscribe, GRID computing, Peer-to-Peer (P2P), Message Oriented Middleware (MOM), Reflective Middleware, Service Oriented Applications (SOA) and Mobile Agents. This course is cross-listed with ENGR 5710G Network Computing. 3 cr. Prerequisite: undergraduate course in Distributed Systems.

CSCI 5120G Principles of Distributed Computing. This course addresses the design and analysis of distributed algorithms. Emphasis is placed on developing problem-solving skills and fully exploiting design tools and techniques. Students develop the analytical tools and skills needed to evaluate the costs of complex designs and protocols. 3 cr. Prerequisite: a course in algorithms at the undergraduate level.

CSCI 5130G Programming Language Implementation. This course is a survey of the techniques that are used to implement different types of programming languages with an emphasis on run-time organization and code generation. Topics covered in this course include memory management, garbage collection, code generation, code optimization, code generation for mobile and embedded devices, and code optimization for power saving. 3 cr. Prerequisite: an undergraduate course in compilers.

CSCI 5140G Ecology of Online Learning. The aim of this course is to examine the context in which online learning has evolved to build understanding of not only the present but also to enable students to look ahead at the potential. Problems facing the continuous development of e-learning are also explored. From a survey of the brief history of online learning, with a close look at the symbiotic relationship between technological development, pedagogical evolution, and socio-economic pressures, the students will find, adapt and use theoretical models to analyze current online learning situations. 3 cr.

CSCI 5150G Evolution or Revolution: Informatics Design Principles. In the context of the move to Web 2.0 and 3.0, as well as the subsequent development of concepts such as “cloud computing” and “social software”, the aim of this course is to explore the concept of Informatics and the complexity of its application to fields such as online education. As the Internet develops from a technical wonder and an information tool to more of a social interaction device, education and lifelong learning in all fields are undergoing massive changes as they take advantage of this new potential. Students in this course will explore the fundamentals of design-based research as it applies to designing learning environments that are consistent with social, educational and cognitive sciences that have converged to study the processes of developing human knowledge with such major concepts as “collective intelligence” and “social construction of knowledge”. 3 cr.

CSCI 5160G Topics in Software Design. This course covers one or more topics in software design that are not currently covered by the other courses in the program. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr.

CSCI 5170G Empirical Software Engineering. This course provides an overview of advanced topics in empirical software engineering. Students learn how to design, implement and interpret the results of empirical studies. In particular, students gain insight into the benefits and drawbacks of different empirical methods such as benchmarks, controlled experiments, ethnographies and surveys. Students also obtain experience with critically evaluating and reproducing existing empirical software

engineering research. 3 cr. Prerequisites: undergraduate courses in Statistics and Software Engineering.

CSCI 5300G Computer Communication Networks. This course provides a detailed technical presentation of important networking concepts and protocols used in modern communication network architecture. Descriptions of the principles associated with each OSI network layer are provided with many examples drawn from the Internet and wireless networks. The TCP/IP protocol stack is discussed in detail with a variety of examples on its various layers. Particular attention is given to performance analysis of ARQ techniques, access methods (ALOHA and CSMA), and network delay and throughput analysis in WAN and LANs. Network addressing design (including VLSM and CIDR) is discussed in detail and various routing methods (Distance vector and Link-state) are compared. Advanced networking protocols such as ATM and MPLS are briefly introduced. This course is cross-listed with ENGR 5660G Communication Networks and MITS 5200G Advanced Communication Networks. 3 cr.

CSCI 5310G Cryptography and Secure Communications. This course covers diverse topics on cryptography and security, including classical encryption, symmetric and public-key cryptography, key management, message authentication, digital signatures, denial-of-service (DoS), distributed DoS, malicious software and intrusion detection systems. This course is cross-listed with ENGR 5670G Cryptography and Secure Communications, and MITS 5500G Cryptography and Secure Communications. 3 cr.

CSCI 5320G Malware Analysis. This course covers diverse topics such as worms, virii, Trojan horses and rootkits ranging from simple JavaScript malicious code to the use of sophisticated malware tools. The course delivers theory with emphasis on practical skills to defend against malware. A sample final project may consist of creating a malware analysis environment to safely capture and study specimens. 3 cr.

CSCI 5330G Network Optimization. This course provides a comprehensive and up-to-date study of network optimization problems. Network optimization includes both major types of optimization problems: continuous and discrete. Network flow optimization models and extensions are studied, with a focus on the theory and algorithms for a wide-ranging collection of network problems such as shortest path, maximum flow, minimum cost flow, spanning tree, matching, traveling salesman, multicommodity flow and generalized assignment. Both linear programming and combinatorial optimization methods are discussed in the context of formulating and solving the network problems. 3 cr. Prerequisite: an undergraduate course on computer networking that covers the fundamentals, e.g., CSCI 3150 (Computer Networks).

CSCI 5340G Performance Evaluation of Computer Networks. This course provides students with mathematical models and tools to analyze performance of computer systems and networks. It covers fundamentals of queuing theory, Markov chains, analysis of single-server and multi-server systems, QoS in networks of queues, analysis of access techniques as well as simulation techniques for network traffic and services. 3 cr. Prerequisite: CSCI 5300G Computer Communication Networks.

CSCI 5350G Pervasive and Mobile Computing. This course provides an introduction and comprehensive view into technologies relevant to pervasive and mobile computing. Topics include cellular and personal wireless area networks, service discovery protocols, context-aware computing, and middleware platforms and software to support pervasive and mobile computing. This course is cross-listed with ENGR 5720G Pervasive and Mobile Computing. 3 cr.

CSCI 5360G Topics in Networks. This course covers one or more topics in networks that are not currently covered by the other courses in the program. The instructor determines the topics that are covered in a particular year and these could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr.

CSCI 5370G Topics in IT Security. This course covers one or more topics in IT security that are not currently covered by the other courses in the program. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr.

CSCI 5500G Auditory Perception and Virtual Audio. To be immersed in a virtual environment, the user must be presented with plausible sensory input, including auditory cues. A virtual (three-dimensional or spatial) audio display aims to allow the user to perceive the position of a sound source at an arbitrary position in three-dimensional space, despite the fact that the generated sound may be emanating from a fixed number of loudspeakers at fixed positions in space or a pair of headphones. The foundation of virtual audio rests on the development of technology to present auditory signals to the listener’s ears so that these signals are perceptually equivalent to those the listener would receive in the environment being simulated. This directed reading course examines the human perceptual and technical literature relevant to the modelling and generation of accurate audio displays for virtual environments. Approaches to acoustical environment simulation are summarized and the advantages and disadvantages of the various approaches are presented. 3 cr.

CSCI 5510G Computer Graphics. This course introduces the basic concepts and algorithms of computer graphics. It covers the methods needed to model and render 3D objects. It covers graphics displays, parametric representations, curves and surfaces, geometrical optics, affine and perspective transformations, visibility, illumination and reflectance models, radiometry, energy transfer models, parametric representations, curves and surfaces, texture mapping, ray tracing, graphics toolkits and animation systems. This course is suitable for students starting their graduate studies. 3 cr.

CSCI 5520G Computer Vision and Games. This course introduces students to topics in computer vision and image processing, and how to apply these algorithms to interaction in video games. Topics include advanced image processing techniques, camera calibration, cameras as input devices, data filtering, state estimation and tracking, motion capture and gesture recognition techniques. 3 cr.

CSCI 5530G Serious Game Development. In contrast to traditional teaching and learning environments whereby the teacher controls the learning (e.g., teacher-centered), videogames present a learner-centered approach to learning whereby the player controls the learning through interactivity; this allows the player to learn via active, critical learning. Videogames provide students the opportunity to learn to appreciate the interrelationship of complex behaviours, sign systems and the formation of social groups. In addition to these benefits, the advantages of videogames to other applications have not gone unnoticed. In fact, videogame technology has been adopted and applied to applications whose primary purpose is not entertainment. These are referred to as serious games. Serious games “leverage the power of computer games to captivate and engage players for a specific purpose such as to develop new knowledge or skills.” Specifically, serious games support the development of analytical, spatial, strategic, recollection, psychomotor and visual selective attention skills. Further benefits of serious games include improved self-monitoring, problem recognition and solving, improved short- and long-term memory, increased social skills and increased self-efficacy. Serious games have been employed in a number of learning-based applications including educational, national, security, corporate management, military, government and in the training of emergency personnel/first responders and health care workers. This graduate-level course examines various aspects of serious games including i) technical components, ii) psychological components (and their application to learning) and iii) the business of serious games. A number of existing commercial and non-commercial serious games are examined. 3 cr.

CSCI 5540G User Interface Technology. This course covers the hardware and software techniques used in the implementation of user interfaces. Topics covered in this course include input devices, output devices, window managers, interaction techniques, user interface builders, 3D user interfaces and user interface styles.

Students will gain experience in developing different types of user interfaces on a variety of hardware configurations. 3 cr.

CSCI 5550G Topics in Digital Media. This course covers one or more topics in digital media that are not currently covered by the other courses in the program. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr.

CSCI 5700G Introduction to Services Computing. This course introduces the fundamental concepts and applications of service computing. Service computing, as a new cross discipline, addresses how to enable IT technology to help people perform business processes more efficiently and effectively. One of the fundamental components in service computing is Web service. Web services are Internet-based application components published using standard interface description languages and universally available via uniform communication protocols. Web services let individuals and organizations do business over the Internet using standardized protocols to facilitate application-to-application interaction. This course is cross-listed with ENGR 5770G Service Computing. 3 cr.

CSCI 5710G Services Computing Security. This course covers the security-related technologies in services computing. Topics covered include the eXtensible Markup Language (XML) and a portfolio of related security standards such as XML Signature, XML Encryption, XML Key Management, WS-Security and Security Assertion Markup Language (SAML), eXtensible Access Control Markup Language (XACML), the Platform for Privacy Preferences (P3P) and Web X.0, in response to the growing need for a platform independent language for supporting interoperable information in services computing infrastructure. The course provides a services computing context to these more technical issues. Strategy and policy topics on how to find the right balance between security and usability are addressed as well as the maintenance of a secure infrastructure. 3 cr.

CSCI 5720G Topics in Health Informatics. This course covers one or more topics in health informatics that are not currently covered by the other courses in the program. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr.

CSCI 5730G Topics in Information Science. This course covers one or more topics in information science that are not currently covered by the other courses in the program.

The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr.

CSCI 5740G Intelligent Systems. This course covers the elements of intelligent systems including constraint satisfaction problem solving, planning and machine learning. Emphasis is made on the application of intelligent systems in a variety of different domains including computer vision, computer gaming, natural language processing, text analysis and web analysis, data processing and bioinformatics. Students are introduced to the basic mathematical theory of artificial intelligence (AI) and exposed to the application aspect of AI in real-life contexts. 3 cr. Prerequisite: undergraduate courses in Algorithms and Data Structures.

CSCI 6001G PhD Dissertation. The dissertation is the primary component of the PhD degree requirements. The research must lead to an original contribution of knowledge in the field, which must be reported fully in the candidate's dissertation. The research is carried out under the direction of the candidate's supervisor or co-supervisors in co-operation with a supervisory committee. This thesis is accompanied by an oral thesis defence. The student receives a grade of pass or fail. 40 cr. Prerequisite: good standing in the PhD in Computer Science program.

CSCI 6020G Formal Methods for Computer Science. This course is a survey of the formal methods that are the theoretical basis of many areas of computer science. This course is normally offered as a reading course with the topics tailored to the students program of study. Topics to be covered may include logic, graph theory, coding theory, computational complexity, formal languages, automata, models of parallel programs and programming language semantics. 3 cr. Prerequisite: enrolment in a Computer Science graduate program.

CSCI 6100G Advanced Topics in Software Design. This course covers one or more advanced topics in software design that are not currently covered by the other courses in the program. This course is aimed at senior graduate students who have already taken one or more courses in this field. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr. Prerequisite: a previous course in the software design field.

CSCI 6300G Advanced Network Design. Advanced Network Design is a graduate course designed to give the students the skills they need to architect, build and analyze the next generation networks. The course material covers the design process from the

requirement analysis phase to architectural design, technology selection, implementation and performance evaluation. The course addresses several theoretical aspects of network design, such as fundamentals of queuing theory, delay analysis, flow optimization and topology design as well as practical aspects of network architectural design for efficient addressing and routing, multi-protocol integration, protection and restoration, and security and network management solutions. 3 cr. Prerequisite: CSCI 5300G Computer Communication Networks.

CSCI 6310G Advanced Topics in Networks. This course covers one or more advanced topics in computer networks that are not currently covered by the other courses in the program. This course is aimed at senior graduate students who have already taken one or more courses in this field. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr.

CSCI 6320G Advanced Topics in IT Security. This course covers one or more advanced topics in IT security that are not currently covered by the other courses in the program. This course is aimed at senior graduate students who have already taken one or more courses in this field. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr.

CSCI 6500G Advanced Computer Animation. This course introduces advanced concepts in computer animation. Students critically analyze and explore advanced animation algorithms applicable to simulation and game development. Integration of the animation core with physics and artificial intelligence systems are explored to define complex and interesting animation behaviour. 3 cr.

CSCI 6510G Visual Modelling. This advanced graduate course focuses on physics-based modelling and dynamic simulation, including their applications towards visual computing. The unified, physics-based approach to various visual computing fields, such as graphics, visualization, biomedical image processing, vision, virtual environments and animation, are explored. 3 cr. Prerequisite: undergraduate level course in computer graphics.

CSCI 6520G Advanced Topics in Digital Media. This course covers one or more advanced topics in digital media that are not currently covered by the other courses in the program. This course is aimed at senior graduate students who have already taken one or more courses in this field. The instructor determines the topics that are covered

in a particular year and they could change from one year to another. 3 cr. Prerequisite: a previous course in the digital media field.

CSCI 6700G Advanced Information Management. This course covers advanced topics in information management technology and literature. Students are introduced to modern data models including relational, XML, unstructured text data and data on the Web. Query languages including SQL, Xquery, information retrieval techniques and their evaluation and optimization algorithms are discussed. Students are also introduced to non-classical query techniques which incorporate data mining, machine learning and AI algorithms. Finally, the topic of visualization and summarization of very large volumes of data are briefly covered. 3 cr. Prerequisites: undergraduate courses in Database Systems and Concepts, Algorithms and Data Structures.

CSCI 6710G Advanced Topics in Health Informatics. This course covers one or more advanced topics in health informatics that are not currently covered by the other courses in the program. This course is aimed at senior graduate students who have already taken one or more courses in this field. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr. Prerequisite: a previous course in the health informatics field.

CSCI 6720G Advanced Topics in Information Science. This course covers one or more advanced topics in information science that are not currently covered by the other courses in the program. This course is aimed at senior graduate students who have already taken one or more courses in this field. The instructor determines the topics that are covered in a particular year and they could change from one year to another. Topics are determined by the instructor before the start of the course. A detailed description of the course content will be posted before the start of term. 3 cr. Prerequisite: a previous course in the information sciences field.

CSCI 7010G PhD Thesis Proposal and Candidacy Exam. Students in the Computer Science PhD program are required to submit a comprehensive thesis proposal outlining their research objectives and proposed methodology. This thesis proposal also consists of a literature review that addresses the current state of knowledge of the particular research topic. This course consists of an oral candidacy exam that evaluates the students' grasp of the literature and their particular research plan. Topics in this course vary with students' specific research projects. This non-credit course is evaluated on a pass/fail basis. 0 cr. Prerequisite: enrolment in the Computer Science PhD program.

EDUC 5001G Principles of Learning. This course serves as an introduction to the variety of ways that human learning is thought about within educational contexts. This

course helps students understand some of the similarities and differences that exist among a variety of learning theories. Because the application of theory in educational practice (praxis) is a key element of this course, students are encouraged to see new pathways of possibility for teaching and learning in their own educational experiences. Students may assess the success of the course sessions by evaluating the degree to which their experiences in the course have provoked them toward reflective practice for their own learning communities. This course is required of all students. 3 cr.

EDUC 5002G Research Methods in Education. This course is a general introduction to educational research methods. The epistemological assumptions about the nature of knowledge and the relationship between theory and evidence are extensively examined across a broad range of approaches to research. Students consider the types of questions that can be answered through research as well as the practical and ethical questions that arise in educational research. A central goal of the course is to instil a culture of disciplined inquiry for modern teaching professionals. As graduate students, they become critical readers and consumers of research. There is, in addition, a praxis element to this course, as participants are encouraged to build capacity for engaging in research-driven practice. Technology has a significant role to play in the research process, but caution must be observed with respect to the ethics of collection of information. The importance of computer software packages for both quantitative and qualitative analysis is also introduced. This course is required of all students. 3 cr.

EDUC 5003G Advanced Research Methods and Design. This is a seminar course that examines advanced methods, techniques and software for educational research. The course is intended for students taking the MA program and the project option in the MEd. Many of the examples in the course come from the work of current or past students doing thesis and project research. One outcome of the course for most students is an initial draft of a research proposal that can be presented to their advisor for discussion or elaboration, or as the basis for beginning the research mentoring process. This course is mandatory for MA students and recommended for MEd project option students. 3 cr. Prerequisite: EDUC 5002G.

EDUC 5004G The Reflective Practitioner. This course reviews theory and research on teachers as reflective practitioners. The course begins with an examination of the different research traditions that have informed research and theory about teaching and learning. Consideration of historically important theories such as those of Dewey and Tyler serves as a basis for analyzing contemporary thinking and research. Topics include curriculum planning and development, instructional design, communities of teaching and learning, models of teaching, assessment of student learning (including student course evaluation), teaching for/in diversity, teacher induction, mentoring, professional development and the role of reflection in teacher professional development. 3 cr.

EDUC 5005G Social and Cultural Context of Education. Students are asked to critically examine their own practice and its context. Issues of power and privilege as they operate in the field of education are central unifying themes of the course. The investigative approach includes ethical reasoning, autobiographical reflection, arts/aesthetics, deconstruction and sociological analysis. Students attempt to work through a series of questions in order to understand the complexities in schooling and in education in general. This course includes sociological explorations that help to focus on issues of schooling. Lived experiences and burning issues are used as ways of exploring personal experiences. Educators also draw upon professional lived experiences and are asked to examine these experiences within the light of concepts introduced in course reading materials. There is a conscious attempt, through autobiographical and experiential learning, to examine the social and cultural foundations of education. As a foundations course, it relates course learning to educational research in order to assist educators in thinking about their own platforms for educational research. 3 cr.

EDUC 5101G Learning with Technology. This course examines the growing body of theory and research on the use of technology for learning. The historical, theoretical and research knowledge base developed in EDUC 5002G is the foundation for the work to be done here. Students examine recent and current learning technologies in the light of research and theory on learning. It is expected that students will see the ways in which specific choices of technology are more or less suited to different expected learning outcomes. Specific topics that may be considered include systems of thought that favour or oppose the use of technology in education for a priori reasons, analysis and categorization of existing software or online systems, communication technologies and online learning, informatics and the knowledge society, online learning communities, constructivist approaches to applications of technology, constructivist/constructionist course design, training systems and technological support, and technology in higher education. 3 cr.

EDUC 5102G Educational Technology and Communication. Technology can extend the ability of the instructor and students to communicate in educational settings. Multimedia elements of computer-based instruction possess strengths and limitations as communication tools. This course examines various theories of communication and learning and their application to the multimedia world of instructional technology to traditional and non-traditional learning settings. Innovative ways of enhancing and improving educational communication are emphasized. 3 cr.

EDUC 5103G Online Technology in Education. This course explores the integration of online technology (e.g., synchronous and asynchronous communication, and learning management systems) into educational practice. The course focuses on issues such as the ways in which online technology enhances and inhibits learning, accessibility,

reflection, social learning, cognitive processing, quality of discussion, role of educator, individual differences in use and learning performance. Particular attention is given to the role that technological developments have played in inviting educators to reconsider fundamental educational concepts. 3 cr.

EDUC 5104G Learning Tools. Considerable money and effort has been directed toward introducing technology into education; however, multiple obstacles experienced by educators have impeded progress. These include lack of time, insufficient access to software and hardware, limited technological skill, low confidence and not understanding how to integrate technology into teaching. This course examines potentially promising tools that address many of the barriers that educators experience with technology. Key areas covered include establishing a clear definition, accessibility, reusability, interactivity, graphics, reduction of cognitive load, adaptability, pedagogical value, evaluation and instructional wrap. Students learn about these concepts by designing and evaluating learning object based instruction. 3 cr.

EDUC 5105G Technology Diffusion in Education. In this course, technology diffusion in education is examined. Consideration is given to how teachers, learners and educational administrators promote, resist, adopt, transform and repurpose technologies in education. The emphasis in this course is placed on information and learning technologies, but the particular case of education in the context of the general dynamics of technology diffusion, transfer and translation is considered. Information and communication technologies are understood in their broader context of use within modern society. 3 cr.

EDUC 5199G Special Topics in Education and Digital Technologies. Special topics courses present material in an emerging field or one not covered in regular offerings. Each year up to two or three special topics in technology and informatics courses may be offered to enable students to experience particular topics in depth. In the area of technology and informatics, for instance, courses such as Special Topics in Computer Assisted Language Learning or Special Topics in Adaptive Technologies for Special Education may be offered periodically. 3 cr.

EDUC 5201G Foundations of Leadership. Leading theorists and researchers, established and emerging theories, and trends of leadership will be examined from diverse perspectives, including critical theory perspectives. The course will focus on leadership positions and the problems, dilemmas and opportunities faced in educational, public and human service organizations. 3 cr.

EDUC 5202G Organizational Theory, Culture and Decision Making. This course introduces organizational theory and its related sub-topics including organizational structure, culture, design, behaviour, change, leadership and decision making. Students

will explore diverse perspectives of organizational life by examining organizational theory and applying the theoretical constructs to a variety of organizational contexts and real-life and/or case-based circumstances. Students will be encouraged to critically analyse the theories and to relate them to practice in their fields. 3 cr.

EDUC 5203G Dynamics of Change. This course explores major concepts that impact successful implementation of change such as theories of change and models of change. Change theory and models, as well as components of change, will be applied to investigations of classroom, school, district and societal change. The role of culture and the roles of stakeholders will be central to this exploration. Graduate students will reflect on their roles within major educational changes. Other major concepts include the exploration of vision, mission, the institutionalization of change and interference or resistance to change. Students will be encouraged to act as reflective practitioners and introduce materials and/or resources which connect theory, research and practice. 3 cr.

EDUC 5204G Staff Development and Supervision. This course investigates the process of teacher learning as it applies to the needs of the early practitioner and experienced teacher. This includes staff development, teacher supervision and teacher growth through reflective practice. Staff development theory and practice will be examined as well as current research in measuring the impact of teacher learning. The conceptual bases outlined in current theory, research and practice in the models of teacher supervision are critically examined relative to current policies on teacher supervision. 3 cr.

EDUC 5205G Leadership and Technology. Significant educational leadership principles, models in the use of technology, and the influence of information and communication technology on educational leadership are explored and applied. Course topics include common vision; analysis of needs; development; access and security; integration into instruction; assessment and evaluation; professional development; and infrastructure of the school system including administrative software, community relationships, ethical legal issues and other educational policy implications. The result will be a plan of significant value to the master's candidates' educational technology leadership role. 3 cr.

EDUC 5206G Education Law and Governance. This course examines questions focusing on legal, ethical and governance issues in public education. Topics include social media, digital rights, cyber bullying, the Canadian Charter of Rights and Freedoms, freedom of speech, academic freedom, off-duty behaviour of educators, liability for student injury, negligence and due process. The social context of schools will be addressed from various perspectives. 3 cr.

EDUC 5299G Special Topics in Leadership and Administration. Special topics courses present material in an emerging field or one not covered in regular offerings. Each year up to two or three special topics in leadership and administration courses may be offered to enable students to experience particular topics in depth. In the area of leadership and administration, for instance, courses such as Special Topics in Emerging Governance Areas or Special Topics in Leadership Succession may be offered periodically. 3 cr.

EDUC 5301G Curriculum Theory. The aim of this course is to explore the theoretical aspects of the study of curriculum and learning as presented in the research literature. The course provides a language for conceptualizing educational questions, reviews the major themes in the literature, provides a framework for thinking about curriculum changes and change, and assists students in developing critical and analytical skills appropriate to the scholarly discussion of curriculum and improving student learning. It is designed to help students to develop an understanding of curriculum by identifying the concepts and discussions that constitute the curriculum field. Thus, students apply an informed theory to their own contexts of practice. The course is participatory and practice-based (entailing critical reflection on curriculum practice in light of reading and discussion), responsive and collaborative (focusing on the particular contexts and interests of participants) and critical (entailing constructive critique of education and other values and assumptions that inform curriculum policy, organization and practice). 3 cr.

EDUC 5302G Curriculum Planning and Implementation. This course defines and illustrates practical methods for completing important curriculum development tasks such as (a) identifying appropriate course and unit objectives; (b) developing useful growth schemes; (c) developing effective teaching techniques; and (d) constructing practical assessment strategies. Particular attention is given to problem-solving skills. Instructional changes associated with elementary and secondary school reform are examined. Examples will be negotiated and may include such innovations as curriculum integration, teaching for deep understanding, reciprocal teaching, authentic assessment, co-operative learning, self-directed learning and computer-mediated instruction. Theoretical foundations, research findings, implementation issues and implications for other reform dimensions (restructuring, re-culturing and retiming) are explored for each approach selected. 3 cr.

EDUC 5303G Technology and the Curriculum. This course involves an examination of the theoretical underpinnings and practical questions concerning the educational use of technology in a constructivist learning environment. The pedagogical application of technology includes the implementation of computers and other instructional technologies for teaching and learning such as video and audio multimedia (e.g., film, audio recordings and television). The focus is on developing a critical perspective

regarding the use of technology in educational contexts that relates and looks forward to the articulation of an ethics of teaching practice. Topics representative of technology and education issues are selected from the following theories and definitions of technology: implications of various modes of technology contexts for models of teaching and learning practice; evaluating the use of multimedia resources for educational contexts (e.g., internet, software, video and audio recordings, and television); technology, diversity and educational equity; articulating an ethics of teaching practice with respect to the educational use of technology, computer-mediated learning, telecommunications and multimedia resources; online teaching and learning; the use of virtual environments for educational purposes; problems of classroom integration; and computer support for professional development and administration. 3 cr.

EDUC 5304G Digital Literacy: Theory, Practice and Research. Postmodern literacies have proliferated in response to the rapid expansion of digital technologies and network interconnectivity in the 21st century. The kinds of texts produced for and by the current knowledge economy are artifacts of digital rather than industrial technologies; these technologies have had considerable impact on how people read and write. This course examines what we have learned about the impact of digital technologies to this point with a view to understanding what it means to be literate in a digital age. We consider the continuing overlap of pre-print, print and post-print forms within the larger history of literacy artifacts. We consider the effect of word processors, hypermedia, and the Web 2.0 on writing and reading practices, and we experiment with emerging web-based social software such as wikis and weblogs. From legal boundaries of who owns what words in cyberspace to recognizing new orthographies, new identities, new contexts for learning and new poetics in digital contexts, we explore the various socio-political and educational aspects of digital communications technologies. 3 cr.

EDUC 5305G Authentic Assessment. The ultimate goal of this course is to enable educators to help their students to be able to think about their own learning processes. Authentic assessment is not about final exams and bell curves. The focus of this course is to research, analyze and apply a variety of assessment techniques and applications that are based on the notion that people learn most effectively when they are able to relate what they are learning to their previous knowledge. Assessment is defined within the context of simulating authentic life-related tasks. Young children and adolescents also need to understand their own thought processes through self and peer assessment if they are to see their own growth potential and develop self-motivation and self-esteem. Graduate students in this course learn key principles of authentic assessment and how to differentiate among assessments (such as criterion-referenced and norm-referenced). They apply theory to examine underlying issues concerning high stakes standardized testing. As they study how to create more effective rubrics and objective test items, they think critically about how to better assess their students' academic

development. By the end of the course, participants understand the differences between assessment for learning and assessment of learning. 3 cr.

EDUC 5399G Special Topics in Curriculum. Special topics courses present material in an emerging field or one not covered in regular offerings. Each year up to two or three special topics in curriculum courses may be offered to enable students to experience particular topics in depth. In the area of curriculum, for instance, courses such as Special Topics in Science and Math Education or Special Topics in Humanities Education may be offered periodically. 3 cr.

EDUC 5401G Introduction to Adult Education and Higher Education. The purpose of this course is to survey fundamental concepts and issues in the field of adult education within the current digital context. Students will examine a variety of literature and engage in discussions that allow an exploration of broad topics in adult education and digital technology. Potential topics include, but are not limited to, the adult learner in a digital age; contexts, problems and issues in adult education; teaching in an adult learning environment; and the use of digital technologies in adult education. 3 cr.

EDUC 5402G The Adult Learner in a Digital Age. The purpose of this course is to explore the characteristics of the current adult learner and the general principles underlying adult learning in the digital age. Students will develop and demonstrate an understanding of major theories of adult learning. Potential topics include, but are not limited to, the cognitive, social and emotional makeup of the adult learner, the nature of self-directed and transformative learning experiences, the role of reflection in professional practice and the challenges associated with using digital technologies. 3 cr.

EDUC 5403G Adult Education: Contexts, Problems, and Issues. The purpose of this course is to describe and interpret the problems and issues associated with the varied contexts in which adults teach and learn. Students will examine and analyze formal and informal models of adult education such as those offered by universities, colleges, workplaces and those pursued independently for personal interest. Potential topics include, but are not limited to, equity and access issues, management and policy issues in adult education, and social action resulting from experiences in adult education. 3 cr.

EDUC 5404G Teaching in an Adult Learning Environment. The purpose of this course is to develop an understanding of pedagogical approaches designed to meet the current and future needs of the adult learner. Students will analyze current models of teaching and adapt these strategies and approaches to specific topics, courses and contexts that are relevant to the adult learner. Potential topics include, but are not limited to, case study analysis, scholarship of teaching and learning in higher education, and course planning and implementation. 3 cr.

EDUC 5405G Digital Technologies in Adult Education. The purpose of this course is to analyze and evaluate the potential of a variety of present and cutting-edge digital technologies when used by adults for the purpose of learning. Students will challenge themselves to explore unfamiliar digital technologies and their application to learning outcomes for their professional and personal lives. Topics include, but are not limited to, the use of digital technologies for communication purposes, social interaction, collaboration, information access and creation, and information processing. 3 cr.

EDUC 5501G Directed Studies. Faculty permission may be given for supervised research projects, individual study or directed readings in a specialized area not covered in the regular course offerings. Students wishing to pursue a course of directed studies must, with a qualified faculty member who is willing to supervise such a course, formulate a proposal accurately describing the course title, learning goals, content, reading list, course activities and schedule; the intended method and extent of supervision; and the method by which work will be evaluated. This course may be only taken once. 3 cr.

EDUC 6100G MA Thesis – Part 1. The thesis is the major component of the Master of Arts program and is carried out under the direction of the student's supervisor or supervisory committee. The thesis may involve an investigation which is fundamental in nature or applied and may incorporate elements of analysis, design and development. Through the thesis, candidates are expected to give evidence of competence in research and a sound understanding of the area of specialization involved. 3 cr.

EDUC 6101G MA Thesis – Part 2. Continuation of Part One. 3 cr.

EDUC 6102G MA Thesis – Part 3. Continuation of Part Two. 3 cr.

EDUC 6103G MA Thesis – Part 4. Continuation of Part Three. 3 cr.

EDUC 6201G MEd Graduate Research Project - Part 1. Part one of the MEd Graduate Research Project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The chosen topic will be dependent on the area of specialization of the student, using resources normally available on campus. 3 cr.

EDUC 6202G MEd Graduate Research Project - Part 2. Part two of the MEd Graduate Research Project provides students with the opportunity to continue the work they started in part one. Students will be expected to present a formal paper and oral defence at the end of the course. 3 cr.

EDUC 6300G MEd Graduate Portfolio. Students collect authentic evidence that documents their development and learning over the course of their graduate program.

Students select and organize relevant artifacts to create a web-based portfolio which reflects the course-based and extra-course activities related to their program and professional goals. The chosen topic is dependent on the area of specialization of the student, using resources normally available on campus. They share their portfolios with peers during an online presentation. Students receive a grade of pass or fail for the portfolio. 3 cr.

ENGR 5001G MASc Thesis. The thesis is the major component of the MASc program and is carried out under the direction of the student's supervisor. The thesis may involve an investigation that is fundamental in nature or may be applied incorporating creative design. Through the thesis, candidates are expected to give evidence of competence in research and a sound understanding of the area of specialization involved. The student will receive a grade of either pass or fail. 15 cr.

ENGR 5002G MEng/MEngM Project (formerly MEng Project). The master's project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The chosen topic will be dependent on the area of specialization of the student. The student will receive a grade of either pass or fail. 9 cr.

ENGR 5003G MASc Seminar. Participation in a program of seminars by internal and external speakers on current research topics. All MASc students will be required to give a seminar on their thesis research during the second year of their program. The student will receive a grade of either pass or fail. 0 cr.

ENGR 5004G MASc/MEng Directed Studies. Faculty permission may be given for supervised research projects, individual study, or directed readings. MASc/ MEng students wishing to pursue a course of directed studies must, with a faculty member who is willing to supervise such a course, formulate a proposal accurately describing the course content, the learning goals, the intended method and extent of supervision, and the method by which work will be evaluated. This course may only be taken once. 3 cr.

ENGR 5005G Special Topics. Presents material in an emerging field or one not covered in regular offerings. This course may be taken more than once, provided the subject matter is substantially different. 3 cr.

ENGR 5010G Advanced Optimization. The objective of this course is to understand the principles of optimization and its application to engineering problems. Topics covered include the steepest descent and Newton methods for unconstrained optimization; golden section, quadratic, cubic and inexact line searches; conjugate and quasi-Newton methods; the Fletcher-Reeves algorithm; fundamentals of constrained optimization theory; simplex methods for linear programming; modern interior-point

methods; active-set methods and primal-dual interior point methods for quadratic and convex programming; semi-definite programming algorithms; sequential quadratic programming; and interior-point methods for non-convex optimization. In addition, implementation issues and current software packages/algorithms for optimization will be covered. Global optimization, including genetic algorithms and simulated annealing, will be introduced. 3 cr.

ENGR 5011G Advanced Engineering Design. This course covers the basics of design philosophy, methodology, principles and theory as a foundation for surveying current research areas in the product development process. A brief introduction to concurrent design and life cycle design is followed by addressing the application of the design process to problem solving. The relationship between creativity and the design process is explored by using tools for solving engineering system design and synthesis problems. Computer, mathematical and/or physical modelling of the problem and solution; the axiomatic design approach; Taguchi robust design; design of experiments; and prototyping are strongly emphasized topics. 3 cr.

ENGR 5012G Advanced and Smart Materials. The core material will consist of basic features of physical transducer behaviour, mathematical constitutive models and material properties, characterization methods and experimental data, sensor and actuator devices, translation of material behaviour to device behaviour, solid state devices, nonsolid state devices (motors and pumps), mesoscale and MEMS devices, and adaptive structures. However, due to the rapid evolutions in the field, the syllabus will be dynamic to respond to the new developments in materials and their applications. The topics will be continually reviewed and monitored for currency. Selected topics from the following list will also be covered: fundamental principles, mechanisms and applications of piezoelectric materials, ‘negative’ materials, conductive polymers, advanced composites, shape memory materials, magnetorheological fluids and intelligent textiles. 3 cr.

ENGR 5013G Advanced Engineering Mathematics. Review of fundamentals of linear algebra; eigenvalue, singular value, Cholesky and QR decompositions; properties and applications; Topelitz matrices; Laplace transforms; Fourier analysis; conformal transformation; selected topics in ordinary and partial differential equations. 3 cr.

ENGR 5014G Pollution Prevention and Sustainable Engineering. Industry-environment interactions; pollution prevention; sustainability and sustainable development; sustainable engineering; industrial ecology; environmental impacts and concerns; material and energy budgets, life-cycle assessment, reduction of industrial process wastes (solid, liquid, gaseous); design for environment; design for energy use and efficiency; energy sustainability; industrial applications. 3 cr.

ENGR 5015G Advanced Computer Aided Geometric Design. This course will cover advanced computational topics in the design of geometric objects and various techniques for mathematically representing, modeling and inspecting complex curves and surfaces. The course provides an advanced study of geometric modeling and the required methods to describe the shape of complex three-dimensional objects for engineering design and computer-aided engineering applications. The course also covers the engineering applications of curves and surface geometric modeling, reconstruction of 3-D CAD models from digital scans, accuracy and robustness of geometric computations, geometric tolerances and the principles of coordinate metrology-based surface inspection methods. 3 cr.

ENGR 5100G Advanced Energy Systems. Advanced power and refrigeration cycles. Advanced gas turbine systems. Combustion systems and applications. Energy storage. Nuclear reactor technology. Fuel cells. Solar power. Wind power. Hydro power. Co- and tri-generation. Geothermal district heating systems. Energy and exergy analysis of advanced energy systems. 3 cr.

ENGR 5101G Thermal Energy Storage. General introductory aspects for thermal engineering including energy storage systems, thermal energy storage methods, thermal energy storage and environmental impact, energy storage and energy savings, solar energy and thermal energy storage, heat transfer and stratification in sensible heat storage systems, latent heat storage systems, heat storage with phase change, thermodynamic optimization of thermal energy storage systems, energy and exergy analyses of thermal energy storage systems, and thermal energy storage case studies. 3 cr.

ENGR 5102G Fuel Cells and Hydrogen Systems. Introduction to hydrogen and hydrogen fuel cells. Efficiency and open circuit voltage. Operational fuel cell voltages. Proton exchange membrane fuel cells. Alkaline electrolyte fuel cells. Direct methanol fuel cells. Medium and high-temperature fuel cells. Fuelling fuel cells. Components of fuel cell power systems. Delivering fuel cell power. Analysis of fuel cell systems. Fuel cell calculations. Tests. 3 cr.

ENGR 5120G Advanced Fluid Mechanics. Derivation of three-dimensional conservation equations of mass, momentum and energy for compressible viscous fluids. General properties of Navier-Stokes equations. Examples of exact solutions of the Navier-Stokes equations. Approximate solutions for creeping motions. Laminar boundary layer equations and methods of solution: derivation of boundary layer equations, boundary layer separation and general properties of boundary layer equations; Von Karman momentum-integral equations; finite-difference solutions. Stability of laminar flows: theory of small disturbances; Orr-Summerfield equation, transition. Introduction to turbulence. Applications. 3 cr.

ENGR 5121G Advanced Turbo Machinery. Basic thermodynamics and fluid mechanics equations and definitions of efficiencies in turbomachines. Two-dimensional cascades (cascade analysis, performance of cascades and cascade correlations). Axial flow turbines. Radial flow turbines. Axial flow compressors. Centrifugal compressors and fans. Applications of turbomachinery to engineering problems. Design, analysis and performance analyses of turbomachines. Transport phenomena aspects. Software use and tests. 3 cr.

ENGR 5122G Computational Fluid Dynamics. Introduction to CFD modelling and mesh generation software. Basic equations of fluid flow and commonly used approximations. Turbulence modelling (one and two equation models and higher order models). Iterative solution methods and convergence criteria. Practical analysis of turbulent pipe flow mixing elbow and turbomachinery blade problems. Software use and tests. 3 cr.

ENGR 5140G Advanced Heat Transfer. Introduction and conservation equations. Conservation equations and gas kinetics. Unidirectional steady conduction. Multidirectional steady conduction. Time dependent conduction. External forced convection. Internal forced convection. Natural convection. Convection with change of phase. Heat exchangers. Radiation. Mass transfer principles. 3 cr.

ENGR 5141G Heat Exchanger Design and Analysis. Basic mechanisms of heat transfer, such as conduction, convection, boiling, condensation and radiation. Classification of heat exchangers according to flow. Heat exchanger analysis using LMTD, 2NTUcRPF and NTU methods. Selection criteria of heat exchangers. Thermal-hydraulic and mechanical design of shell-and-tube heat exchangers. Design and analysis of double-pipe heat exchangers. Design and performance evaluation of finned tube heat exchangers. Energy and exergy analyses of heat exchangers. Performance evaluation of plate-fin heat exchangers. Design considerations in boilers and condensers. Fouling growth models and its impact on heat exchanger performance and life-cycle analysis. Flow-induced vibration. Software use and tests. 3 cr.

ENGR 5160G Advanced Thermodynamics. Axiomatic representation of fundamentals of classical thermodynamics. First law of thermodynamics. Equilibrium. Euler and Gibbs-Duhem relations. Second law of thermodynamics. Entropy production. Exergy and irreversibility. Energy and exergy analysis of advanced power and refrigeration cycles. Legendre transformations and Extremum principle. Maxwell relations and thermodynamics derivatives. Stability. Phase transformations. Nernst postulate. Chemical reactions and equilibrium. Case study problems. 3 cr.

ENGR 5161G HVAC and Refrigeration Systems Design and Analysis. Basic concepts. Elements of heat transfer for buildings. Thermodynamic processes in

buildings. Energy use and environmental impact. Human thermal comfort and indoor air quality. Fluid mechanics in building systems. Solar radiation. Heating and cooling loads. Annual energy consumption. Heat transfer equipment. Cooling equipment. Thermal energy storage. Software use and tests. 3 cr.

ENGR 5180G Advanced Nuclear Engineering. The course is an introduction to advanced topics in nuclear engineering, with emphasis on reactor physics. Covered topics include neutron slowing down, resonance absorption, multigroup transport and diffusion equations, reactor kinetics and homogenization methods. Lattice and full-core numerical methods are also covered. This course presumes a knowledge of nuclear physics, differential equations and vector calculus. 3 cr.

ENGR 5181G Advanced Radiation Engineering. This course introduces advanced concepts in radiation engineering, with an emphasis on how ionizing radiation interactions with matter may be modelled. The course reviews fundamental particle interaction mechanics, measurement and detection of radiation, evaluation of nuclear cross sections and various solutions to the Boltzmann transport equation. This course presumes a knowledge of nuclear physics, differential equations and statistics. 3 cr.

ENGR 5221G Computer-Integrated Manufacturing. This course covers Computer-Integrated Manufacturing (CIM) with a particular focus on automated manufacturing process planning. It provides advanced instruction in design and implementation of integrated CAD/CAM, robotics and flexible manufacturing systems. It also provides emphasis on concurrent engineering principles, manufacturing process engineering, computer-aided process planning, NC programming and CAD/CAM integration. The course provides experience with CAD/CAM software and NC machines. 3 cr.

ENGR 5222G Polymers and Composite Processing. Polymer structure-property relations, linear and nonlinear viscoelasticity, dynamic mechanical analysis, time temperature superposition, creep and stress relaxation, mechanical models for prediction of polymer deformation, rubber elasticity, experimental methods for viscosity/temperature/shear rate measurements, application to melts, filled systems and suspensions. Processes for polymers; injection, extrusion, thermoforming, blow molding, rotational molding, compression and transfer molding, calendaring and post-manufacturing operations. Fibre types and properties, fibre forms, polymeric matrix and interfaces, typical composite properties. Processes for long fibre/thermoset composites, pre-pregging, resin transfer moulding, filament winding, pultrusion, autoclave cure. 3 cr.

ENGR 5223G Advanced Manufacturing Processes and Methodologies. This course is about implementing advanced manufacturing processes and methodologies into production operations as the strategy for achieving reductions in inventory costs, faster manufacturing turnaround times, fewer faulty products and using less floor space for

production. It addresses the next generation manufacturing and production techniques that take advantage of the opportunities offered by selective use of new materials and emerging technologies for high efficient machining, coating, forming, assembly operations, etc. Virtual manufacturing methodologies and multi-objective optimization in terms of design, performance, safety, cost and environment as well as advanced manufacturing methodologies, such as lean manufacturing, are also addressed. 3 cr.

ENGR 5240G Advanced Dynamics. This course builds upon the knowledge students have gained in a first dynamics course to cover more advanced dynamical systems. Topics covered will include 3D kinematics and kinetics of particles and systems of particles using Newton's method; equations of motion in normal and tangential, cylindrical and spherical coordinates; two body central force motion with applications in orbital dynamics and particle on a rotating earth. 3D kinematics and kinetics of rigid bodies, Euler angles, single and multiple rotating reference frames, Coriolis acceleration, inertial reference frames, equations of translational motion, angular momentum, rotational motion, body axes and rotation relative to a coordinate system, Euler's and modified Euler's equations of motion with applications in dynamics of gyroscopes, robots and vehicles. Variational mechanics, constraints, generalized coordinates, principles of virtual work, D'Alembert, and Hamilton's principle, concept of Hamiltonian, Hamilton's canonical equations. Lagrange's equation for system of particles and rigid bodies, generalized force and moment, calculus of variations, concepts of Lagrangian and Lagrange multiplier, Lagrange's equations for holonomic and nonholonomic systems, stability analysis of autonomous and non-autonomous dynamical systems. Numerical solutions of dynamic systems, explicit methods include finite difference and Rung-Kutta, and implicit methods are Houbolt, Wilsontheta, Park stuffy stable and Newark-beta. 3 cr.

ENGR 5241G Advanced Mechanics of Materials. This course builds upon the knowledge students have gained in the first solid mechanics course to cover more advanced mechanics of materials. Topics covered include the general state of stress and strain in three dimensions; formulation of general equilibrium equations; compatibility conditions; constitutive relationships; elasto-plastic relationships; Airy stress function; analytical solutions of special problems including thick-walled cylinders, rotating disks, bucking of columns, stress concentration and curved beams; energy methods in elasticity; torsion problem; bending of beams; contact stresses; analysis of flat plates; creep and relaxation; introduction to fracture mechanics; and fatigue and failure theories. 3 cr.

ENGR 5242G Advanced Vibrations. This course builds upon the knowledge students have gained in a first vibration course to cover more advanced vibrating systems. Topics covered include Lagrange's equations of motion, generalized coordinates and force, virtual work, linearization of equations for small oscillations, multi-degree of

freedom linear systems, mass matrix, flexibility and stiffness matrix, natural frequencies and mode shapes, orthogonality of the mode shapes, modal matrix and decoupling procedure, harmonic force and series solution for arbitrary excitation. Linear continuous systems, free vibration of strings, rods and shafts, lateral vibration of Euler-Bernoulli beams, effect of rotary inertia and shear on the vibration of beams, orthogonality of the mode shapes, harmonic excitation of beams, mode summation method in the case of arbitrary excitation. Approximate methods for free vibration analysis: Rayleigh, Dunkerly, Rayleigh-Ritz, Holzer, Myklestud and matrix iteration methods. Vibration of plates, free vibration analysis using analytical methods, Rayleigh and Rayleigh- Ritz methods, harmonic excitation and Galerkin's method in forced vibration analysis of plates. 3 cr.

ENGR 5243G Mechanics and Dynamics of Machine Tools. This course covers the advanced mechanics and dynamics of machine tools, including applications to automotive machining processes. The course includes advanced topics in the theory of metal removal, mechanics of chip formation, forces, statics and dynamics of machine tool structures. Also, self-excited vibration (chatter), sensor assisted machining and high speed machining of materials will be covered. 3 cr.

ENGR 5244G Advanced Acoustics and Noise Control. The main objective of this course is to provide students with a thorough understanding of skills and knowledge of acoustics and noise control as they relate to research and development. This course covers different aspects of acoustics related to the generation, transmission and reception of acoustic waves. In particular, the following topics will be covered: acoustic wave equation and simple solutions, sound transmission, sound absorption in fluids, radiation and reception of sound waves, acoustics of pipes and cavities, resonators, acoustic filters, instability of shear flows and its coupling with sound waves, and active noise control. 3 cr.

ENGR 5260G Advanced Robotics and Automation. This course builds upon the knowledge students have gained in a first robotics course to cover more advanced kinematics topics and their application to more complex robotic systems such as redundant manipulators and parallel mechanisms. Topics covered include point, direction, line and screw motion descriptions; homogeneous transformations; line and screw coordinates; quaternion representations; inverse displacement solutions by analytic, root finding, hybrid and numerical methods; appropriate frames of reference; screw systems and transforms; local and globally optimum solutions of redundant rates; over determined and near degenerate solutions; singularity analysis; and parallel manipulator kinematics. 3 cr.

ENGR 5261G Advanced Mechatronics: MEMS and Nanotechnology. This course is designed to be an introduction to micro-electromechanical systems (MEMS) and

nanotechnology and their applications. Topics covered include introduction to MEMS and nanotechnology, working principles of MEMS and nanotechnology, design and fabrication of MEMS and nano-systems, microfabrication and micromachining, materials for MEMS and nanotechnology and applications of MEMS and nanotechnology. 3 cr.

ENGR 5262G Manipulator and Mechanism Design. This course is designed to teach students the necessary skills to design or synthesize mechanisms and manipulators to perform desired tasks. Topics covered include synthesis of mechanisms for function generation, path generation and rigid body guidance; graphical, analytical and optimization based methods of synthesis; mechanism cognates, Chebychev spacing, Burmister curves; manipulator joint layout synthesis for spatial positioning and orientation; conditions of singularity and uncertainty; and solution of nonlinear problems of kinetics involved in mechanism synthesis using compatibility equations, 1/2 angle substitutions and dialytic elimination. 3 cr.

ENGR 5263G Advanced Control. This course builds upon the knowledge students have gained in a first control course to cover more materials in advanced control systems. Topics covered include a. State variables and state space models: relations between state space models and the transfer function models (controllable and observable canonical forms, and diagonal form), Jordan form, solutions of linear state equations, transition matrix. b. Controllability and observability: definition and criteria, state feedback and output feedback, pole assignment via state feedback, design of servo controlled systems. c. State estimation and observer: observer state-variable feedback control. d. Multi-input multi-output (MIMO) systems: pole assignment via state feedback. e. Introduction to nonlinear systems: describing functions for kinds of nonlinear systems (on/off, dry friction, dead one, saturation and hystersis), phase plane trajectories, concept of limit cycle. f. Stability analysis: Lyapunov function and Lyapunov stability criterion. g. Introduction to optimal control: linear quadratic regulator (LQR), Riccati equation, properties of LQR systems. h. Sampled data systems: pulse transfer function, zero and first order hold systems, stability and root locus in the z-plane, transformations, Routh Hurwitz stability criterion in the z-plane, system compensation in the z-plane using root locus and generalized PID controllers. 3 cr.

ENGR 5271G Innovative Design Engineering. This course introduces students to the theory, tools and techniques of innovative design engineering and creative problem-solving. The design process in engineering is considered and addressed by stressing its most creative aspects, especially problem definition and concept generation, through emphasis on current industry best practices. A short history of creative engineering solutions, effective methods for communicating new ideas, techniques for creative solutions, and cost effectiveness and tools for innovation are considered and thoroughly addressed. The course involves fundamental coverage of principles of inventive problem solving (TRIZ). TRIZ provides a dialectic way of thinking, i.e., to understand the

problem as a system, to make an image of the ideal solution first and to solve contradictions. The course involves hands-on use of computer-aided design (CAD) tools and project management software in engineering applications. 3 cr.

ENGR 5272G Design Engineering Management. The objective of this course is to understand the key aspects of managing design within a corporate context effectively and systematically. This course seeks to identify and reinforce key challenges in the management of the design of innovative mechanical engineering devices, processes, technologies and services while exploring established and innovative practices. The course is structured around the importance of the interaction between design, business and management items in design organizations and how to make the existence of the innovative design activity visible in the corporate structure by means of strategic planning. Case studies are used to stimulate the students to explore specific issues and/or draw from their own experience, providing valuable knowledge to be shared in class. 3 cr.

ENGR 5273G Design by Failure. This course examines the nature of design failure and shows how analysis of failure can be used in improving new designs. Through analysis of historical and contemporary case studies of catastrophes well known worldwide, students acquire learning experiences from past mistakes to avoid repeating them in the future. The course covers Shippaigaku, the Japanese way to research accidents, scandals and other failures to uncover the root cause, reveal the scenario that led to the unwanted event and describe what happened so students can clearly repeat the steps in their mind and propose ways to avoid those mistakes in the future. Various other methods for failure mode identification are also covered. 3 cr.

ENGR 5274G Design of Sustainable Mobility Systems. Urban air pollution is a major issue of concern today. This course examines various sustainable mobility systems, wherein future vehicles pollute less and consume less fuel than existing transportation systems. Topics cover the design and development strategies for Hybrids and Plug-in Hybrid Vehicles, Electric Vehicles, Natural Gas, Biofules and Flex Fuels Vehicles as well as Advanced Gasoline Engines. The students will learn how to use appropriate engineering design methods and apply knowledge of mathematics, science and engineering science into creatively solving design problems with realistic constraints while using state-of-the-art engineering CAD/CAM/CAE tools, incorporating engineering standards and communicating effectively their work. 3 cr.

ENGR 5275G Design for Product End of Life. This course covers the environmental consciousness of product design in a variety of industries such as the electronics industry where rapid technology cycles make products obsolete at staggering rates. Product end-of-life management is a growing problem in all industrialised countries. The progressive shortening of the effective useful life, as a result of technological

obsolescence, causes serious difficulties in ensuring adequate forms of disposal for the millions of products disposed each year. This course examines disassembly and re-cycling technologies, which are used when the product reaches the end of its useful life. Design for Disassembly (DfD) and Design for Recycling (DfR) techniques are studied for disposal or re-cycling of products. 3 cr.

ENGR 5300G Automotive Engineering. Components of the automobile. Engineering factors in all components and subsystem areas of automobile design. Vehicle characteristics and dynamic interactions. Systems modelling approach and mathematical models for ride, vibration, handling control and powertrains of automobiles. Tire mechanics including construction, rolling resistances, traction/braking properties, cornering and aligning properties and measurement methods. Vehicle mobility, motion performance of the vehicle, characterization of resistances, propulsion system and tractive efforts. Brake system design, braking performance and brake distribution. Steady state handling. Measurement methods. Suspension system design considerations. Design and performance of an automobile from a systems point of view. External factors such as markets, financing and sales. 3 cr.

ENGR 5310G Advanced Vehicle Dynamics. Introduction to transport systems related to vehicle dynamics behaviour. Pneumatic tire mechanics ride, cornering and aligning properties. Transient and steady-state directional dynamics and handling analyses of road vehicles. Directional response and stability analysis in small and large perturbation maneuvers, roll dynamics and rollover, braking performance analyses, directional responses to simultaneous steering and braking inputs, and performance measures. Characterization of road roughness, ride vibration analyses and assessment of ride comfort. Measurement methods and data analyses techniques. Vehicle-driver interactions analysis of the closed loop vehicle-driver system. Introduction to typical control strategies for vehicle dynamic control. 3 cr.

ENGR 5320G Automotive Aerodynamics. Formulation of fluid mechanics and aerodynamics for automotive design. Inviscid and viscous flow. Wind tunnels and their applications to external aerodynamics. Aerodynamic drag coefficient and its effect on vehicle performance. Experimental methods, drag force measurements and wind tunnel instrumentation. Computational aerodynamics. Comparisons between experimental results and numerical results. Aerodynamic design for drag reduction. Aerodynamics of engine cooling. Fluid structure interactions. Aerodynamic noise. 3 cr.

ENGR 5330G Automotive Powertrains. Design of automotive power transmission systems. Loads on the vehicle. Evaluation of various engine and vehicle drive ratios on acceleration performance and fuel economy. Manual transmission and automatic transmission. Combustion in CI and SI engines. Selection of combustion chamber type and shape, intake and exhaust systems. Differences between engine types. Cylinder

number, configuration, size and material selection. Selection of mixture preparation and firing order. Mechanism of combustion. Fuel and additive characteristics. Fuel metering and ignition systems. Exhaust emissions and control systems. Heat transfer, friction and lubrication systems. Air pollution. Exhaust systems. Effects of emission on air quality. Sources of auto emission. 3 cr.

ENGR 5340G Automotive Noise, Vibrations and Harshness. Evaluating the vibration and acoustic characteristics of automotive systems and components. Human comfort and annoyance guidelines and standards. Sound, hearing and physiological effects of noise and vibration. Modelling and experiment methods. Modal analysis and digital signal processing. Noise sources such as gears, bearings, rotating imbalance, gas flow, combustion and impact. Source-path-receiver identification. Sound transmission, airborne and structure-borne noise. Structural-acoustic interactions. Noise and vibration passive/active control. 3 cr.

ENGR 5350G Automotive Materials and Manufacturing. Materials in the automotive industry. Selection of materials and shapes. Materials processing and design. Interaction of materials. Performance of materials in service. Examples of new materials. Role of environmental regulations and societal pressures on the selection of alternate materials. Manufacturing processes, including casting, forging, forming, machining and molding, for the automotive industry. Quality control and techniques, process selection and methods. Manufacturing considerations for various lightweight automotive structural materials. Stiffness, fatigue, vibrations, dent resistance and crush resistance. Methods of producing lightweight automotive structures are discussed. Design for manufacturing, assembly, disassembly and recycling. 3 cr.

ENGR 5360G Automotive Electronics and Software. Electrical systems in automobiles, including power supplies, junction transistors, sensors and rectifiers. Signal amplifiers, gain bandwidth limitations and circuit models. Motor drive control, inverters, actuators, PWM controllers, active filters, signal conditioners, power electronics and regulators. Battery chargers and solar cells. Vehicle software systems. Onboard software systems and corresponding algorithms. Software interfaces between electronics and drivers and passengers. Embedded software in vehicles. 3 cr.

ENGR 5370G Automotive Design Engineering. Methodology of vehicle system design, including the overall objectives and constraints relevant to vehicles. Total design of an automobile from an initial concept to creation, use and disposal. Design issues for various lightweight automotive structural materials (plastics, mouldings, composites), including stiffness, fatigue, vibrations, dent and crush resistance. Crashworthiness and design for safety. Design for manufacturing, automation, assembly, disassembly and recycling. Automotive applications of computer-aided design (CAD). Applications of automotive engineering design tools such as FEA, CFD and particularly including PACE

software like ADAMS, Fluent, Autostudio, Unigraphics, Nastran and LSDYNA. Students will use PACE tools in an automotive design project using the software for structural, aerodynamic, materials, thermal and/or other design aspects of automotive systems. 3 cr.

ENGR 5410G Project Management for Engineers. This course prepares engineers for the effective application of project management to their work. It covers the following topics: project integration, project scope, cost management, time management, engineering quality, human resources, project communications, risk management and procurement management. The course uses the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) with relevant examples from nuclear, software and other fields of engineering. Special emphasis is placed on Risk Management, particularly in the area of safety-critical engineering projects. The student will be well-positioned both to apply the knowledge in their area of engineering and to write the PMI's Project Management Professional (PMP) examination. 3 cr.

ENGR 5415G Foundations of Engineering Management. Fundamentals of engineering management. Managerial accounting: cost-volume-profit analysis, costing systems and standard costs, activity-based costing, relevant costing. Organizational behaviour: motivation, stress management, effective leadership, communication, work teams. Quantitative decision making in engineering: scoring models, AHP, decision trees, mini-max regret and other strategies. 3 cr.

ENGR 5420G Quality Management. Quality engineering and management evolution, definitions, concepts and principles. Topics include philosophy of quality, quality engineering and management tools, design of experiments, statistical process control and engineering statistics. Managing quality processes and quality based projects. 3 cr.

ENGR 5425G Production and Operations Management. This course covers the primary tools and methods used in the management of production and operations of engineering systems. Product demand forecasting: moving averages, exponential smoothing, inventory management, economic order quantity, (s,S) policy, (r,Q) policy, news vendor models, dynamic programming models, production planning, linear and integer programming models and solutions, lean manufacturing principles, and operations and job scheduling. 3 cr.

ENGR 5430G Energy Systems Management. Effective management of energy systems by monitoring, controlling and optimizing their performance. Concepts and techniques of energy management and conservation. Energy auditing; improving energy utilization in space conditioning; insulation; hot water and compressed air systems; steam distribution systems; energy saving opportunities in fired heaters, boilers, refrigeration and cooling systems; continual improvement and awareness of

energy efficiency throughout an organization; cogeneration; trend analysis and annual consumption forecasts to effectively manage energy systems; waste-heat recovery and synthesis of heat and power networks; heat exchanger network optimization. 3 cr.

ENGR 5605 Convex Optimization. This course concentrates on recognizing and solving convex optimization problems that arise in engineering. The topics covered in this course include basics of convex analysis, such as convex sets, convex functions and convex optimization problems; log-concave and log-convex functions; quasi-convex and quasi-concave functions; convexity with respect to generalized inequality; least-squares; linear and quadratic programs; semi-definite programming; geometric programming; minimax; extemal volume; optimality conditions; Lagrange dual functions and problems; duality theory; theorems of alternative and applications; algorithms for solving unconstrained and constrained optimization problems; interior-point methods; applications to signal processing, control, digital and analog circuit design; computational geometry; and statistics. 3 cr.

ENGR 5610G Stochastic Processes. Review of probability theory including random variables, probability distribution and density functions, characteristic functions, convergence of random sequences and laws of large numbers. Random processes, stationarity and ergodicity, correlation and power spectral density, cross-spectral densities, response of linear systems to stochastic input, innovation and factorization, Fourier and KL expansion, and mean square estimation. Applications in communications and signal processing, with emphasis on problem-solving using probabilistic approaches. 3 cr.

ENGR 5620G Digital Communications. Optimum receiver principles: AWGN, geometric representation of signals, maximum likelihood criterion and optimum decision regions, correlation receivers and matched filters, probability of error and union bound; digital bandpass modulation (FSK, PSK, QAM), baseband systems, performance comparisons: bit error rate, bandwidth, power, complexity; adaptive equalization techniques and algorithms; carrier and symbol synchronization; fundamental limits in information theory: entropy and the source coding theorem; channel capacity and the channel coding theorem; information capacity theorem and design tradeoffs. 3 cr.

ENGR 5630G Statistical Signal Processing. This course covers two fundamental areas of statistical signal processing. Detection Theory: fundamentals of detection theory, Neyman-Pearson theorem, receiver operating characteristics, minimum probability of error, Bayes risk, binary multiple hypothesis testing, minimum Bayes risk detector, Maximum Likelihood detector, Chernoff bound, detection of deterministic and random signals. Estimation Theory: mathematics of estimation theory, minimum variance unbiased estimation, Cramer-Rao lower bund, linear models, general minimum

variance unbiased estimation, best linear unbiased estimators and Maximum Likelihood estimation. 3 cr. Credit restrictions: ENGR 5631G, ENGR 5632G.

ENGR 5631G Advanced Estimation Theory. Mathematics of estimation theory. Bayesian estimation and Minimum Mean Squared Error (MMSE) estimation. Minimum variance unbiased estimation. Cramer-Rao lower bound. Linear models. General minimum variance unbiased estimation. Best linear unbiased estimators. Maximum Likelihood (ML) estimation. General Bayesian estimators. Linear Bayesian estimator. Kalman filtering. Extension to complex data and parameters. Robust estimation. Distributed estimation. Decentralized signal processing. Real-world applications. 3 cr. Credit restriction: ENGR 5630G.

ENGR 5632G Advanced Detection Theory. Fundamentals of detection theory. Neyman-Pearson theorem. Receiver operating characteristics. Minimum probability of error. Bayes risk. Binary multiple hypothesis testing. Minimum Bayes risk detector. Maximum Likelihood detector. Chernoff bound. Detection of deterministic and random signals. Robust detection. Sequential, model change detection. Quickest change detection. Distributed detection. Decentralized signal processing and decision making. 3 cr. Credit restriction: ENGR 5630G.

ENGR 5640G Advanced Wireless Communications. This course covers wireless communications systems, technologies and standards; statistical modeling of wireless channels; capacity of wireless channels; channel equalization; diversity techniques including time, frequency, code and space diversity; cooperative communications and user co-operation diversity; adaptive modulation; multiple antennas and space-time communications; multicarrier communications; multiuser communication and multiple access schemes; cognitive radio and game theory; and ad hoc and wireless sensor networks. 3 cr.

ENGR 5650G Adaptive Systems and Applications. This course covers algorithms, filter structures and applications in adaptive systems. Basic information processing operations and recursive algorithms are discussed. Also, distinct methods for deriving recursive algorithms for the operation of adaptive filters are identified. Lastly, applications of adaptive filters, mainly to digital communication systems, are explored in detail. 3 cr.

ENGR 5660G Communication Networks. This course provides a detailed technical presentation of important networking concepts and protocols used in modern communication network architecture. Descriptions of the principles associated with each OSI network layer are provided with many examples drawn from the Internet and wireless networks. The TCP/IP protocol stack will be discussed in detail with a variety of examples on its various layers. Particular attention is given to performance analysis of

ARQ techniques, access methods (ALOHA and CSMA), and network delay and throughput analysis in WAN and LANs. Network addressing design (including VLSM and CIDR) is discussed in detail, and various routing methods (Distance vector and Link-state) are compared. Advanced networking protocols such as ATM and MPLS are briefly introduced. This course is cross-listed with CSCI 5300G Computer Communication Networks and MITS 5200G Advanced Communication Networks. 3 cr.

ENGR 5670G Cryptography and Secure Communications. This course covers diverse topics on cryptography and security, including classical encryption, symmetric and public-key cryptography, key management, message authentication, digital signatures, denial-of-service (DoS), distributed DoS, malicious software and intrusion detection systems. This course is cross-listed with CSCI 5310G Cryptography and Secure Communications, and MITS 5500G Cryptography and Secure Communications. 3 cr.

ENGR 5680G Information Theory. This course covers in detail Shannon's mathematical theory of communication, 1948 to present; entropy, relative entropy, and mutual information for discrete and continuous random variables; Shannon's source and channel coding theorems; mathematical models for information sources and communication channels, including memoryless, first-order Markov, ergodic, and Gaussian; calculation of capacity-cost and rate-distortion functions; Kolmogorov complexity and universal source codes; side information in source coding and communications; network information theory, including multiuser data compression, multiple access channels, broadcast channels and multi-terminal networks; and discussion of philosophical and practical implications of the theory. 3 cr.

ENGR 5690G RF and Microwave Engineering for Wireless Systems. The course focuses on the analysis and design of RF and microwave circuits for applications in wireless communication systems. Overview of wireless systems, transmitter and receiver system parameters, RF network analysis, modern microwave planar technologies, passive and active RF and microwave circuits used in wireless systems, and major aspects of hardware implementations will be covered. The essentials of computer-aided design of RF and microwave circuits are also addressed. 3 cr.

ENGR 5710G Network Computing. This course teaches how to design and implement loosely coupled distributed systems. It presents hands-on experience as well as theoretical background in network computing models and design principles. Topics in scalability, performance, security, resource specification and discovery, naming and indexing, and resource management for distributed systems will be discussed in the context of network computing paradigms like publish/subscribe, GRID computing, Peer-to-peer (P2P), Message Oriented Middleware (MOM), Reflective middleware, Service

Oriented Applications (SOA) and Mobile Agents. This course is cross-listed with CSCI 5110G Network Computing. 3 cr.

ENGR 5720G Pervasive and Mobile Computing. This course provides an introduction and comprehensive view into technologies relevant to pervasive and mobile computing, and an overview of cellular and personal wireless area networks, service discovery protocols, context-aware computing, and middleware platforms and software to support pervasive and mobile computing. This course is cross-listed with CSCI 5350G Pervasive and Mobile Computing. 3 cr.

ENGR 5730G Advanced Algorithms and Data Structures. This course presents detailed knowledge of many advanced data structures and algorithm design techniques for the construction of data structures and practical experience with implementation, evaluation and comparison of complex data structures. It continues where a core undergraduate course on Data Structures and Algorithms left off. At the end of the course, students are able to implement and evaluate advanced data structures, describe and analyze advanced data structures and compare advanced data structures in different computational models. 3 cr.

ENGR 5740G User Interface Design. This course is an introduction to user interface design and implementation on a wide range of hardware platforms. It covers the basic techniques used in user interface design, how users behave, implementation tools and techniques, and the evaluation of user interface designs. It covers both desktop and mobile environments, including the design of user interfaces for cell phones, PDAs and mobile games. 3 cr.

ENGR 5750G Software Quality Management. This course focuses on an intensive investigation into software quality engineering issues including testing techniques, defect detection and prevention, reliability engineering, examination of maintenance issues and configuration management as well as software evolution issues, including planning for evolution. Students will do a major team project examining issues in defect reduction. The course will have a strong industrial flavour. 3 cr.

ENGR 5760G Software Metrics. This course covers analysis of software metrics, an introduction to the techniques of measurement, syntax and semantics of software metrics, and planning a metrics program using metrics for prediction (quality, project time estimations). Case studies. 3 cr.

ENGR 5770G Service Computing. This course introduces the fundamental concepts and applications of service computing. Service computing, as a new cross discipline, addresses how to enable IT technology to help people perform business processes more efficiently and effectively. One of the fundamental components in service computing is web service. Web services are Internet-based application components

published using standard interface description languages and universally available via uniform communication protocols. Web services let individuals and organizations do business over the Internet using standardized protocols to facilitate application-to-application interaction. This course is cross-listed with CSCI 5700G Introduction to Services Computing. 3 cr.

ENGR 5775G Knowledge Discovery and Data Mining. This course covers the discovery of new knowledge using various data mining techniques on real-world datasets, and the current research directions represent the foundation context for this course. This course utilizes the latest blended learning techniques to explore topics in foundations of knowledge discovery and data mining; data mining approaches; and the application of data mining within such diverse domains as health care, business, supply chain and IT security. Current research directions, trends, issues and challenges are also explored. 3 cr.

ENGR 5780G Advanced Computer Architecture. This course covers evolution of computer architecture and factors influencing the design of hardware and software elements of computer systems. Topics include processor micro-architecture and pipelining, performance measures, instruction set design, cache and virtual memory organizations; protection and sharing; I/O architectures, hazards and exceptions, dependencies, branch prediction, instruction-level parallelism, memory hierarchies, cache organization, buses, rotating storage and I/O subsystem design. 3 cr.

ENGR 5850G Analog Integrated Circuit Design. This course covers modelling of IC devices, current sources and mirrors, gain stages, level shifters, analysis and design of BJT and MOS operational amplifiers, current feedback amplifiers, wideband amplifiers and comparators. Frequency response of amplifiers, feedback techniques, analysis and design, stability and compensation of amplifiers, high slewrate topologies, noise in IC circuits, fully differential circuits, analog multipliers and modulators, CAD tools for circuit design and testing. 3 cr.

ENGR 5860G Digital Integrated Circuit Design. This course covers the analysis and design of digital integrated circuits. Students are instructed in methods and the use of computer-aided design tools for the design and testing of large-scale integrated digital circuits. 3 cr.

ENGR 5910G Embedded Real-Time Control Systems. This course focuses on the design and implementation techniques for embedded real-time control systems. It covers embedded system design, instruction sets for microprocessor architecture, I/O, interrupts, hardware and software of embedded systems, program design and analysis, practical issues, multi-tasking operating systems, scheduling and system design techniques. 3 cr.

ENGR 5915G Discrete Time Control Systems. This course covers sample-and-hold systems, discretization of analog systems, discrete-time systems analysis and design and effects of sampling on controllability and observability, pulse transfer function, zero and first order hold systems, stability and root locus in the z-plane, transformations, Routh-Hurwitz stability criterion in the z-plane, pole-placement for discrete time systems and generalized PID controllers. 3 cr.

ENGR 5920G Analysis and Control of Nonlinear Systems. This course covers introduction to nonlinear systems, phase plane analysis, stability determination by Lyapunov direct method, advanced stability theory, existence of Lyapunov functions, describing function analysis, nonlinear control system design by feedback linearization, sliding control, variable structure control, adaptive control of linear and nonlinear systems, control of multi-output systems, and control of multi-input multi-output systems. 3 cr.

ENGR 5930G Adaptive Control. This is a course on the general principles of adaptive control and learning. This course will cover real-time parameter estimation, deterministic self-turning regulators, stochastic and predictive self-tuning regulators, model reference adaptive systems, gain-scheduling, properties of adaptive systems, robust adaptive control schemes, adaptive control of nonlinear systems, and practical issues and implementation. 3 cr.

ENGR 5940G Intelligent Control Systems. With the advance of increasingly faster computing hardware and cheaper memory chips, computational intelligence, also known as a part of soft computation, is becoming more and more important in control engineering. This course will equip students with the essential knowledge and useful resources to solve some of the systems control problems not easily solved using conventional control methods. This course will cover fundamentals of fuzzy set theory, structures of fuzzy logic controllers, structures of neural networks, learning algorithms and genetic algorithms. 3 cr.

ENGR 5945G Mobile Robotic Systems. This course covers kinematics models and motion control for mobile robots; navigation, including path planning, obstacle avoidance and techniques for decomposition, localization using odometry, map representation, map building and introduction to probabilistic map-based localization; Kalman filter localization and other localization systems; computer vision, including imaging and image representation, feature extraction, pattern recognition, motion from 2D image sequences, image segmentation, sensing and object pose computation, and virtual reality. 3 cr.

ENGR 5950G Computational Electromagnetics. The course covers the most widely used computer techniques for engineering problems dealing with the electromagnetic

field and wave. Finite difference time domain method, method of moments, finite element method and asymptotic techniques will be introduced. Practical applications of these methods to RF/Microwave and millimeter wave circuits, antennas and radiowave propagation in wireless communication systems will be addressed. 3 cr.

ENGR 5960G Power System Operations, Analysis and Planning. This course covers resistance, inductance and capacitance of transmission lines; steady state transmission capacity; network compensation; voltage management; load flow simulation; transient stability simulation; system security; system planning; and symmetric operation of power systems. 3 cr.

ENGR 5970G Advanced Power Electronics. This course covers fundamentals of power conversion techniques: single-phase and three-phase rectifier and inverter circuits; switch mode converters and power supplies; resonant converters with zero-voltage switching and zero-current switching; multilevel converters; and application of converters to adjustable speed motor drives and other industrial applications. 3 cr.

ENGR 5980G Advances in Nuclear Power Plant Systems. A combination of lectures, self-paced interactive CD-ROM study and the use of power plant simulators imparts to students the advances in the key design and operating features of the main nuclear power plant types, including reactors using pressure vessels and pressure tubes, pressurized water, boiling water and gas cooled reactors; the use of natural versus enriched fuel, converters and breeders; overall plant control systems, load following capabilities and islanding operations; safety systems; and responses to abnormal and emergency events. 3 cr.

ENGR 5985G Advanced Power Plant Technologies. The course covers fundamental principles and concepts and discusses using various energy sources, e.g., coal, oil, gas, renewable (hydro, wind, solar, etc.) and nuclear, for advanced power generation. The advances in power generation systems such as gasification systems, combined cycle power generation and cogeneration are also considered. Solid oxide fuel cell integrated power generation systems are covered and their role in power generation systems is discussed. A special emphasis is given to nuclear-based power generation. Some energetic, environmental, economic and sustainable aspects of power plants are also covered. Efficiency analyses of the systems and their components are conducted. 3 cr.

ENGR 5990G Utility Applications of Static Converters. This course covers fundamentals of control of active and reactive power flow in the utility grid. The technology of Flexible AC Transmission Systems and High Voltage DC Transmission Systems will be explained. Modelling and simulation of these systems with the aid of digital simulators like EMTP RV will be demonstrated. 3 cr.

ENGR 5995G Grid Integration of Renewable Energy Systems. This course covers the integration of energy systems into an electrical grid involving power generation and transmission. Particular emphasis is given on renewable energy sources such as wind, solar, hydrogen (fuel cells), small-scale hydro, tidal and bio-mass. Integration of these small and distributed energy sources into a grid presents particular problems which will be thoroughly discussed. Benefits of distributed power, competitive markets and the regulatory side of power generation systems will be examined. This course will also cover Integrated Resource Planning (IRP) and Demand-Side Management (DSM) for distributed energy resources. 3 cr.

ENGR 6001G PhD Candidacy Exam. Each student in the doctoral program is required to prepare a written research proposal and pass an oral candidacy exam. The thesis proposal consists of a literature review to address the current state of knowledge in the research field, thesis objectives, research hypothesis to be tested/examined, proposed methodology, timeline, major milestones and expected significance of the research outcomes. The course includes an oral candidacy exam that evaluates the student's research proposal, knowledge of the research field and background preparation. This non-credit course is evaluated on a pass/fail basis. 0 cr. Prerequisite: enrolment in the respective engineering PhD program.

ENGR 6002G Dissertation. The dissertation is the primary component of the PhD degree requirements. The research must lead to an original contribution to knowledge in the field and must be reported fully in the candidate's dissertation. The research is carried out under the direction of the candidate's supervisor or co-supervisors in co-operation with a supervisory committee. The student will receive a grade of either pass or fail. 40 cr.

ENGR 6003G PhD Seminar I. Students participate in seminars by internal and external speakers on current research topics. All PhD students are required to give two seminars on their thesis research, typically within the second and final years of their program. This is the first PhD seminar course that is expected to be taken within the second year of their program. The student will receive a grade of either pass or fail. 0 cr.

ENGR 6004G PhD Directed Studies. Faculty permission may be given for supervised research projects, individual study or directed readings. PhD students wishing to pursue a course of directed studies must, with a faculty member who is willing to supervise such a course, formulate a proposal accurately describing the course content, the learning goals, the intended method and extent of supervision, and the method by which work will be evaluated. This course may only be taken once. If a PhD student has previously taken ENGR 5004G, then the course content of ENGR 6004G must be different than ENGR 5004G. The course ENGR 6004G cannot be taken if ENGR 5004G was taken previously in the same program of study. 3 cr.

ENGR 6006G Workshops. This course consists of a series of mandatory workshops to aid in the professional development of PhD candidates. Workshop topics include project management, intellectual property, grantsmanship, communications and career management. The student will receive a grade of either pass or fail. 0 cr.

ENGR 6013G PhD Seminar II. Students participate in seminars by internal and external speakers on current research topics. All PhD students are required to give two seminars on their thesis research, typically within the second and final years of their program. This is the second PhD seminar course that is expected to be taken in the final year of their program. The student will receive a grade of either pass or fail. 0 cr. Prerequisite: ENGR 6003G.

HLSC 5010G Research in the Health Sciences. This course critically examines various research paradigms and methods used by health scientists. Particular emphasis is placed on those employed by Health Sciences faculty in their current research. These methods include qualitative and narrative methods, quantitative methods of varied sorts (e.g., secondary data analysis, survey research), action research, program evaluation and constructive research. 3 cr. Prerequisite: undergraduate courses in statistics and research methods.

HLSC 5020G Studies in Community Health. This course orients students toward community health research. It explores the range of factors that impact community health (e.g., the physical environment, public policy, the socio-cultural and economic context, community organization and individual behaviours) along with various interventions available to promote health and well-being. 3 cr.

HLSC 5030G Studies in Kinesiology. This course will require students to research and present orally a thorough overview of the current state of knowledge on a particular topic related to Kinesiology. The students should also be able to identify key gaps in knowledge. This seminar must address how advances in the related area of research will benefit science and society. The presentation will be expected to be appropriate for an interdisciplinary audience in Kinesiology. 3 cr.

HLSC 5050G Patient Journey Modelling. The focus on patient safety and the delivery of improved health care has seen many organizations initiating improvement projects aimed at redesigning the delivery of health care and, in particular, the patient's journey. Patient Journey Modelling (PJM) is a patient-centric activity that details a patient's progress through a health care system for a given service. The goal of PJM is to improve health care quality by eliminating unproductive work and reducing variability within the care process. This course enables students to develop an awareness of the latest computing and information technology competencies, methods and architectures as applied within the context of patient journey modelling (and the foundation 'process

modelling' concepts) to support health care administration, management, policy, training, clinical management and clinical research. 3 cr.

HLSC 5060G Special Topics in Health Sciences Research. This course is designed to enable students to focus their research on a particular area in health sciences under the supervision of the thesis supervisor or other qualified faculty. Students investigate specific areas of interest to further their theoretical and research foundation in the health sciences. 3 cr. Prerequisite: permission from instructor.

HLSC 5070G Research-in-Progress Colloquium I. In the first half of this two-term seminar course, students present their research-in-progress (their thesis/project proposal) to peers and respond to the research of colleagues. Emphasis is on the experience of doing research, exploring diverse methods, and ethical and other issues within the context of an academic or health sciences career. Inquiry within an interdisciplinary community of learning is facilitated through making theoretical/philosophical/methodological commitments transparent. Students should have completed their thesis/project proposal in preparation for this course. This course complements the work of a student's committee. 1.5 cr. Note: Students registered in HLSC 5070G must register in HLSC 5071G to receive a grade.

HLSC 5071G Research-in-Progress Colloquium II. In the second half of this two-term seminar course, students present their research-in-progress (their thesis/ project research) to peers and respond to the research of colleagues. Emphasis is on the experience of doing research, exploring diverse methods, and ethical and other issues within the context of an academic or health sciences career. Inquiry within an interdisciplinary community of learning is facilitated through making theoretical/philosophical/ methodological commitments transparent. This course complements the work of a student's committee. 1.5 cr. Prerequisite: HLSC 5070G. Note: Students are expected to take this course immediately after HLSC 5070G.

HLSC 5096G MHSc Thesis in Health Sciences. The MHSc thesis is the culmination of the Health Sciences master's degree program and is carried out under the supervision of the student's supervisory committee. The thesis must investigate a meaningful problem within the health sciences and employ sound research strategies to address the problem. Through the thesis process, the student is expected to demonstrate significant research skills and substantial understanding of a chosen problem area within the health sciences. Typically, the thesis will be approximately 75 pages in length and will be defended orally before an examining committee. 15 cr.

HLSC 5097G MHSc Graduate Project in Health Sciences. The graduate project is the culmination of the Health Sciences master's degree program for those who chose not to undertake an MHSc thesis. The project is carried out under the supervision of the

student's supervisory committee. The project must explore a meaningful problem within the health sciences, thoroughly investigate current knowledge about the problem and critically analyze, organize and evaluate the results of the investigation. At the discretion of the project supervisor, this might require that some empirical research be conducted. Typically, the project will be approximately 50 pages in length. 9 cr.

HLSC 5111G Public Policy and Health Promotion. Using a health promotion lens, students examine all stages of the policy-making process (agenda-setting, legislation and regulation, implementation and evaluation). Emphasis is placed on understanding, at each phase of the process, the formal and informal relationships that are developed among actors within and outside government. Where possible, Canadian case studies are used to demonstrate facilitators and barriers to building policy making capacities at multiple levels: individual, community, organization and system. Readings from a variety of international jurisdictions augment the case study material. 3 cr.

HLSC 5113G Strategies in Health Promotion Practice. This course is designed to provide students with an analysis of the principles of intervention at individual, community, organization and policy development levels. An overview of strategies used in the practice of health promotion and evaluation and their application in a variety of health promotion settings are examined. 3 cr.

HLSC 5115G Community Health of Vulnerable Populations. This course focuses on the concept of vulnerability from the perspective of individuals, groups and communities. Students identify vulnerable populations and examine the many factors that can contribute to vulnerability, including social issues and determinants of health. The role of advocacy in addressing the quality of life issues facing vulnerable populations is emphasized. Through selected field experiences and self-reflections, students are challenged to begin to find their own voices as advocates for vulnerable populations. 3 cr.

HLSC 5117G Epidemiology. This course offers an overview of epidemiology. Students are introduced to the history, concepts and terminology of epidemiology. Methods, strategies and design issues of epidemiological investigations will be extensively explored. Topics include concepts and designs in epidemiology, health indicators and measure of health, descriptive and analytic epidemiology, and statistical analysis and approaches. 3 cr. Prerequisites: one or more undergraduate courses in statistics and/or biostatistics; one undergraduate course in quantitative research methods or epidemiology.

HLSC 5118G Applied Biostatistics in Health Sciences. This course will provide students with the necessary skills to plan, conduct and critically appraise the statistical analysis of health–related research projects. Specifically, the course will emphasize the

inter-relationship between the research question, study design and analysis of projects. Learning methods include classroom lectures, online lectures and tutorials. Real-life research projects will be used to illustrate the common biostatistical methods used in health sciences. 3 cr. Corequisite: HLSC 5010G.

HLSC 5119G Program Evaluation. This course is intended to provide students with the opportunity to pursue topics that are of academic interest to them personally. Students must present a proposal for the program evaluation they intend to survey. The proposal should include an overview of the program, the intended learning outcomes, a listing of the planned activities (e.g., a list of readings, media sources to be consulted, plans for evaluating the program) and proposed deadlines. 3 cr.

HLSC 5121G Living with Persistent Conditions. Students explore a variety of persistent conditions through inquiry into patterns of health experience. Health is defined as expanding consciousness and incorporates the personal and social narratives that construct a life. Students work within their selected foci to deepen their theoretical, philosophical and methodological knowledge and skills. 3 cr.

HLSC 5122G Successful Ageing. The purpose of this course is to study successful (healthy) ageing from a biopsychosocial perspective. Students will gain an in-depth understanding of how successful ageing is defined, what the potential and established lifelong predictors of successful ageing are, and what tools or methodologies are currently available to assess successful ageing. An emphasis of this course will be on lifestyle and behavioral predictors such as physical activity; however, student projects can focus on other potential predictors. The most current research from a variety of disciplines will be used to ensure a broad understanding of the topic as it affects middle-aged and older adults. 3 cr.

HLSC 5123G Advanced Qualitative Methods in Health Research. This advanced course in qualitative research provides a theoretical and practical instruction to the major methods of qualitative research. It examines the methodological implications of the philosophical assumptions of major qualitative approaches/frameworks. Significant hands-on opportunities for students include enabling them to apply key concepts in the development of research questions and techniques for data collections, and the analysis of textual and other qualitative data. Additional topics of discussion will include mixed methods research designs, ethical issues in qualitative studies and knowledge translation. 3 cr. Prerequisite: permission from instructor.

HLSC 5190G Advanced Topics in Community Health Research. This advanced topics course extends students' exploration of the details surrounding community health research. Students advance their theoretical and methodological foundation of particular domains within community health and may have the opportunity to apply their

understanding of the relationship between health and the broader community context. 3 cr. Prerequisite: HLSC 5020G Studies in Community Health.

HLSC 5203G Adoption, Use and Impact of Health Informatics Systems. Advances in sophistication of information technology and increased usage of health informatics systems have revealed critical problems in technology adoption by health care providers. This course examines inhibitors of technology adoption that impact design, implementation and usage of electronic health informatics systems. The course introduces research designs for studying technology adoption as well as evaluative strategies for effectiveness of technology adoption during implementation and usage of informatics systems. Detailed case studies are presented to focus attention on real-world problems and solutions as well on usage of information systems to improve interdisciplinary and collaborative patient-centred care. 3 cr.

HLSC 5204G Artificial Intelligence in Health Care. An introduction to techniques using artificial intelligence in their application to the health care field. Topics include search methods, adaptive learning approaches, natural language processing and robotics, and covering application areas in health care ranging from document management, medical imagining, health care administration, decision support systems and assistive devices. 3 cr. Prerequisite: permission from instructor.

HLSC 5290G Advanced Topics in Patient Journey Modelling. This advanced topics course extends students' exploration of the details surrounding a patient's progress through a health care system for a given service. Students advance their theoretical and methodological foundation of the patient journey modelling process and may have the opportunity to apply their understanding of the patient's journey in real health care settings. 3 cr. Prerequisite: HLSC 5050G Patient Journey Modelling.

HLSC 5291G Advanced Topics in Health Informatics Research. This advanced topics course extends students' exploration of the details surrounding health informatics research. Students advance their theoretical and methodological foundation of particular domains within health informatics and may have the opportunity to apply their understanding of how health informatics systems interact with health and health care systems. 3 cr. Prerequisite: permission from instructor.

HLSC 5310G Biology of Infectious Disease. This course introduces students to the impact of infectious diseases on human health. Infectious diseases have been recognized by the World Health Organization (WHO) as one of the top reasons for human death in the world. This course introduces students to current issues related to the major infectious diseases, their causative agents, mechanisms of infections, available prevention/treatment options, challenges in treatment (e.g., antimicrobial resistance) and newer approaches being undertaken to design effective therapeutic

options. This course also gives students a perspective of the economic impact of infectious diseases on communities and society. 3 cr.

HLSC 5312G Research Topics on Human Pathophysiology. This course focuses on the study of mechanisms of human disease by synthesizing current knowledge on the pathophysiological events of common and important conditions. Emphasis is placed on recent scientific literature that advances this knowledge, proposes new mechanisms and highlights specific research approaches to these disorders. Discussions are followed by application of this knowledge to case studies to assure real or potential correlations between new pathophysiological knowledge and clinical research. Although some topics are common, graduate students identify their research areas and interests to individualize and customize the course towards their current research. 3 cr. Prerequisite: undergraduate pathophysiology course.

HLSC 5314G Environmental Determinants of Health. This course explores interactions between environment and human health. It comprehensively addresses principles of environmental health, followed by specific issues regarding harmful environmental agents and Canadian and global environmental health challenges. It is designed to be delivered with the participation of an interdisciplinary faculty team potentially including members from the faculties of Health Sciences, Science and others. It attracts health and non-health graduate students interested in the multifactorial nature of environmental diseases. At the end of this course, students should have a broad understanding of how human health is contextually determined by our environment and be familiar with published seminal environmental health research. Graduate students in this course are exposed to original research that links basic sciences, health and the environment. This course is unique in allowing students to address the importance of environmental agents as determinants of health, to understand the strengths and limitations of environmental health studies and to foresee the relevance of basic research into health and communities. This course is cross-listed with APBS 6200G Environmental Determinants of Health. 3 cr.

HLSC 5316G Cancer Biology. This course allows students to address general principles of cancer biology and their applications to oncology. Emphasis is placed on current established concepts explaining genotypic and phenotypic characteristics in cancer cells that determine their biological and clinical behaviour. This information is applied to specific human cancers that are common and important in Canada. Current research avenues are also discussed by reviewing recent scientific literature in specific topics. 3 cr. Prerequisite: undergraduate course in pathophysiology or cell biology.

HLSC 5320G Neuroscience in Rehabilitation Kinesiology. Chronic neuromuscular disorders are important community health issues. Altered patterns of sensorimotor integration are a common feature of many chronic neural and neuromuscular disorders,

ranging from chronic low back pain to Parkinson's disease. Addressing this disordered integration is the focus of many modern rehabilitative approaches. This course will review the evidence for altered sensorimotor integration, discuss the techniques used to measure it and review some of the current literature on how it may be altered by different rehabilitation strategies. 3 cr. Prerequisite: HLSC 5030G or permission from the instructor.

HLSC 5322G Theory and Application of Biomedical Signals and Images. Biomedical signals and images can provide a wealth of data to aid in the understanding of human anatomy and physiology as well as early detection of changes in human health. In order to work with biomedical signals, it is fundamental to understand the underlying anatomy and physiology which generate these signals as well as the techniques used to acquire, process and interpret these signals. This seminar course uses original literature to discuss issues in signal acquisition and processing for electroencephalography (EEG), transcranial magnetic stimulation (TMS), electromyography (EMG) and electrocardiography (ECG) signals. The physics of data acquisition and interpretation in real-time ultrasound, computed tomography, magnetic resonance imaging (MRI) and functional magnetic resonance imaging (fMRI) are also reviewed and critiqued in terms of how they affect image acquisition, analysis and interpretation. 3 cr. Corequisite: HLSC 5030G or HLSC 5050G or permission from instructor.

HLSC 5390G Advanced Topics in Kinesiology. This advanced topics course extends students' exploration of the details surrounding research in Kinesiology. Students will advance their theoretical and methodological foundation of particular domains within Kinesiology and may have the opportunity to apply their understanding to health related issues. 3 cr. Prerequisite: HLSC 5030G Studies in Kinesiology.

MCSC 6000G Graduate Seminar in Modelling and Computational Science. This course is a year-long seminar series on Modelling and Computational Science which will take place weekly for the entire academic year. Every graduate student enrolled in this course must give a presentation on a research topic. In addition to the student presentations, the seminar features speakers from UOIT and invited speakers from academia, industry and government. Successful completion of the course also requires attendance at the UOIT Faculty of Science Colloquium Series. The student will receive a grade of either pass or fail. 0 cr. Prerequisite: successful completion of all core courses in the program.

MCSC 6001G MSc Thesis. The thesis is the major component of the MSc program and is carried out under the direction of the student's supervisor. The thesis involves an investigation of a research topic with the possibility of leading to a peer-reviewed article. Through the thesis, candidates are expected to give evidence of competence in

research and a sound understanding of the area of specialization involved. Students must prepare and successfully defend a written thesis at the end of the program related to the research they have undertaken. The student's supervisory committee must approve the commencement of the writing of the thesis. The thesis is evaluated by an examining committee and accompanied by an oral presentation. The student must receive a satisfactory report on the written thesis and must demonstrate a thorough understanding of the research topic. The student will receive a grade of either pass or fail. 15 cr. Prerequisite: enrolment in the Modelling and Computational Science graduate program.

MCSC 6002G MSc Research Project. The MSc Research Project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The chosen topic is dependent on the area of specialization of the supervisor. Students must prepare a written research report related to their supervised project at the end of the program. The student's supervisory committee must approve the commencement of the writing of the report. The research report is evaluated by an examining committee. The student is required to give a 30-minute presentation on the research report. The student must receive a satisfactory report on the written research report and must demonstrate a thorough understanding of the research topic. The student will receive a grade of either pass or fail. 6 cr. Prerequisite: enrolment in the Modelling and Computational Science graduate program.

MCSC 6010G Mathematical Modelling. This is a core course and forms an essential part of the MSc program. The student becomes familiar with the fundamental principles and techniques in mathematical modelling, showcased through the use of classical and advanced models in physics, biology and chemistry. Several analytical techniques are introduced through the study of the mathematical models presented. Topics may include population models and epidemiology, neuron and cell dynamics, nonlinear waves in biological, chemical and physical systems, fluid dynamics, pattern formation (in fluid experiments, animal coat patterns, chemical reactions, visual cortex) and coupled systems (neurons, traffic flow, lattice systems). 3 cr. Prerequisite: admission to the MSc program in Modelling and Computational Science.

MCSC 6020G Numerical Analysis. Numerical analysis is the study of computer algorithms developed to solve the problems of continuous mathematics. Students taking this course gain a foundation in approximation theory, functional analysis and numerical linear algebra from which the practical algorithms of scientific computing are derived. A major goal of this course is to develop skills in analyzing numerical algorithms in terms of their accuracy, stability and computational complexity. Topics include best approximations, least squares problems (continuous, discrete and weighted), eigenvalue problems and iterative methods for systems of linear and nonlinear

equations. Demonstrations and programming assignments are used to encourage the use of available software tools for the solution of modelling problems that arise in physical, biological, economic or engineering applications. 3 cr. Prerequisite: admission to the MSc program in Modelling and Computational Science.

MCSC 6030G High-Performance Computing. The goal of this course is to introduce students to the tools and methods of high-performance computing (HPC) using state-of-the-art technologies. The course includes an overview of high-performance scientific computing architectures (interconnection networks, processor arrays, multiprocessors, shared and distributed memory, etc.) and examples of applications that require HPC. The emphasis is on giving students practical skills needed to exploit distributed and parallel computing hardware for maximizing efficiency and performance. Building on MCSC 6020G, students implement numerical algorithms that can be scaled up for large systems of linear or nonlinear equations. Topics may include survey of computer architectures; efficiency guidelines for HPC; parallel algorithm design; programming tools; timing, profiling and benchmarking; and optimizations. 3 cr. Prerequisite: MCSC 6020G.

MCSC 6060G Advanced Statistical Mechanics. Topics include macro and microstates, statistical weight, Boltzmann and Gibbs distributions, partition and grand partition functions; microcanonical, canonical and grand canonical ensembles; statistical mechanics of isolated and interacting systems; Bose-Einstenin and Fermi-Dirac statistics; Quantum statistics of ideal gases; blackbody radiation; and paramagnetism in solids. This course is cross-listed with PHY 4010. 3 cr. Prerequisite: Statistical Mechanics.

MCSC 6070G Advanced Quantum Mechanics. This course expands upon the concepts covered in Introductory Quantum Mechanics, with particular emphasis on applications to real systems. This course examines approximation methods, including time-independent and dependent perturbation theory, variational methods, the WKB approximation and scattering theory. Mathematical computer programs are used to solve problems. This course is cross-listed with PHY 4020. 3 cr. Prerequisite: Quantum Mechanics.

MCSC 6120G Numerical Methods for Ordinary Differential Equations. Differential equations are an indispensable tool for the modelling of physical phenomena. However, most often in practice, analytical solutions to model equations cannot be found and numerical approximations must be made. In this course, practical computational techniques for the numerical solution of ordinary differential equations are covered, with an emphasis on their implementation and the fundamental concepts in their analysis. Topics include numerical methods for initial value problems: forward and backward Euler and trapezoidal scheme; implicit and explicit Runge-Kutta methods, including

general formulation; linear multistep methods: Adams-Bashforth, Adams-Moulton, Backward Differentiation Formulae (BDF); and numerical methods for boundary value problems: simple and multiple shooting and difference schemes. In association with the techniques, topics such as convergence, accuracy, consistency, 0-stability, absolute stability, Astability, stiffness, and error estimation and control are discussed. 3 cr. Prerequisite: MCSC 6020G or equivalent.

MCSC 6125G Numerical Methods for Partial Differential Equations. Partial differential equations (PDEs) constitute a vital modelling tool in science and a rich field of mathematical research. This course is an introduction to the mathematical concepts required to develop accurate, reliable and efficient numerical software for the approximate solution of PDEs. Essential model problems of elliptic, parabolic and hyperbolic type are examined with corresponding numerical approximation techniques. Approximation schemes are compared and contrasted with an emphasis on the convenience of available software as well as error estimation, consistency, stability and convergence. Topics may include finite-difference, finite-element, finite-volume and spectral collocation methods; Von Neumann analysis; time-stepping algorithms and the method of lines; dissipation and dispersion; error estimates; and iterative methods. 3 cr. Prerequisite: MCSC 6020G.

MCSC 6140G Dynamical Systems and Bifurcations. This course provides an introduction to the modern theory of dynamical systems and bifurcation theory, including chaos theory. Dynamical systems theory is an important tool in the modelling of many physical systems, but it is also a rich field of mathematical research in itself. By the end of this course, the student will have acquired a large toolkit of techniques to analyze the dynamical features of ordinary differential equations and discrete dynamical systems. Topics include structural stability, invariant manifolds, local and global bifurcations, reduction methods, routes to chaos and applications. 3 cr. Prerequisite: undergraduate modern theory of ordinary differential equations.

MCSC 6150G Fluid Dynamics. This course gives a unified view of fluid dynamics by emphasizing mathematical structures that reappear in different guises in almost all subfields of fluids. The student becomes familiar with the fundamental principles, techniques and basic equations in fluid dynamics and comes to appreciate the basic nonlinear nature of most fluid flows. Topics include reynolds number and other non-dimensional parameters; stability and scaling; turbulence and the transition from laminar flow to turbulence; Newtonian and non-Newtonian flows; and eigenmodes of a flow problem including nonlinear exchange of energy between modes, lattice gas and Boltzmann models. 3 cr. Prerequisite: admission to the MSc program in Modelling and Computational Science.

MCSC 6160G Transport Theory. The course is a general introduction to transport theory. Continuous medium transport and discrete particle transport are presented in a unified manner through the use of the probability distribution function. Various types of transport problems are presented together with analytic solutions for the simpler problems that allow them. Approximate and numerical methods are also covered. Topics include particle distribution functions, generic form of transport equation, particle streaming, one-speed transport theory, linear collision operators, the Boltzmann collision term, diffusion theory, hydrodynamic equations, eigenvalue problems, boundary value problems, perturbation and variational approximation methods, deterministic numerical methods and Monte Carlo simulations. 3 cr. Prerequisites: undergraduate linear algebra, differential equations, vector calculus.

MCSC 6165G Monte Carlo Methods. This course provides an introduction to the simulation of stochastic processes using Monte Carlo methods. Concepts presented include pseudorandom number and random variate generation, Markov chain models, Monte Carlo integration, variance reduction and numerical optimization. Applications may include solution to the Boltzmann transport equation (specifically for radiation transport), statistical physics, biophysics and queuing theory. This course is cross-listed with NUCL 5040G Monte Carlo Methods. 3 cr. Prerequisites: undergraduate level theory of ordinary and partial differential equations, and introductory statistics.

MCSC 6170G Computational Chemistry. Accessible introduction to the fundamental principles underlying different methods from classical to quantum theories and from first principles through to the latest advances in the area. The main focus is on molecular structures and energetics. Molecular properties and aspects of spectroscopy and dynamics are also covered. Topics include forcefield and electronic-structure methods, electron correlation, basis sets, density functional theory, relativistic methods, hybrid quantal/classical models, excited electronic states, wave function analysis, molecular properties, transition state theory and reaction dynamics and optimization techniques. This course is cross-listed with MTSC 6710G Computational Chemistry. 3 cr. Prerequisites: introductory quantum mechanics and undergraduate mathematics. MCSC 6010G, MCSC 6020G.

MCSC 6180G Computational Physics. The course introduces the fundamental principles which form the basis for carrying out modern HPC simulations in physics, chemistry and materials science; their realization in the form of various numerical algorithms; and applications to different problems and real-world systems. The main focus is advanced methods of studying quantum mechanical and statistical mechanical systems. Approaches considered include density functional theory (DFT) and its formulation in terms of pseudopotential and all electron methods (DFT will be extended to treat excited states and in particular, the optical properties of materials); molecular dynamics simulation, which will be used to describe ground-state properties such as

atomic structure, vibrations and phase transitions, and the structural properties of fluids and fluid mixtures; and Monte Carlo simulation, which will be used to provide molecular-level descriptions of various materials, fluids and fluid mixtures. This course is cross-listed with MTSC 6610G Computational Physics. 3 cr. Prerequisites: undergraduate-level quantum mechanics and statistical mechanics.

MCSC 6210G Advanced Topics in Mathematical Modelling. This course builds on the core course Mathematical Modelling and elaborates on some of its topics in greater detail. In addition, it introduces a variety of special topics in applied mathematics with a focus on industrial and natural processes and phenomena. The topics are chosen according to the needs and demands of the students and the available faculty resources. Topics and application may include auto-correlation of data sets, bifurcations in time-series, embedding time series, modelling stochastic systems, perturbation methods for partial differential equations, travelling wave phase plane, advanced reaction-diffusion phenomena and transition layers, Hausdorff measures, fractal dimension, Belousov-Zhabotinsky reaction, analysis of heartbeat time-series, fractals in science and medicine, chaotic dynamics in symmetric coupled cell systems, time series in the stock market and other financial products. 3 cr. Prerequisite: MCSC 6010G.

MCSC 6220G Advanced Topics in Numerical Analysis. This course explores recent problems in numerical analysis that are at the forefront of current research. The main objective of the course is to familiarize students with contemporary theoretical results and practical algorithms as preparation for doctoral research. The topics are chosen according to the needs and demands of the students. Potential topics include: level-set methods, finite element methods, finite volume methods, spectral methods, numerical optimization, multigrid methods, numerical linear algebra, Krylov subspace methods, preconditioning iterative methods. 3 cr. Prerequisite: MCSC 6020G.

MCSC 6230G Advanced Topics in High-Performance Computing. This course explores recent topics in high-performance computing that are at the forefront of current research. The main objective of the course is to familiarize students with contemporary implementations and practical algorithms as preparation for doctoral research. The topics are chosen according to the needs and demands of the students. Potential topics include distributed computing, cluster computing, grid computing, numerical linear algebra for high-performance computers, domain decomposition methods and parallel preconditioners. 3 cr. Prerequisite: MCSC 6030G.

MCSC 6240G Advanced Topics in Dynamical Systems. This course builds on the topics covered in MCSC 6140G. The course covers advanced material, including recently developed tools, for the analysis of dynamical systems. By the end of the course, students are expected to be able to perform a bifurcation analysis of models that they will encounter in research or industry, including judging when such analysis is

appropriate, choosing the right tools and interpreting the results. The topics are chosen according to the needs and demands of the students. Potential topics include equivariant bifurcation theory and applications; bifurcations in delay and partial differential equations; numerical continuation of bifurcations for ordinary, delay and partial differential equations; and bursting in biological phenomena and other systems. 3 cr. Prerequisites: MCSC 6140G, MCSC 6020G, MCSC 6280G.

MCSC 6280G Advanced Topics in Computational Science. This course explores recent problems in computational science that are at the forefront of today's research. The main objective of the program is to bring students up to date with the current state of the art of computational science and make them ready for PhD research. The topics are chosen according to the needs and demands of the students and the availability of faculty. Potential topics include computational cluster science; quantum computing: concepts, advantages and problems; and quantum Monte Carlo: applications in computational physics, advanced molecular simulations, advanced optimization and advanced Monte Carlo simulations. 3 cr. Prerequisites: MCSC 6010G, MCSC 6020G. Corequisites: as required by the subject matter; e.g., MCSC 6170G Computational Chemistry, MCSC 6180G Computational Physics, MCSC 6165G Monte Carlo Methods.

MCSC 7000G Modelling and Computational Science Professional Skills. This course introduces students to a variety of topics of importance for a career in the academic and non-academic sectors. The focus will be on communication issues, both oral and written. The student's learning will be done through written and oral production as well as case studies and will also feature lectures by the instructor and invited guests on specialized topics such as patent submission and communications in business and industrial settings. 3 cr. Prerequisite: successful PhD candidacy exam.

MCSC 7001G PhD Thesis Proposal and Candidacy Exam. Students in the Modelling and Computational Science PhD program will be required to submit a comprehensive thesis proposal outlining their research objectives and preliminary results. This thesis proposal will also consist of a literature review that addresses the current state of knowledge of their particular research topic. This course will consist of an oral qualifying exam that evaluates the students' grasp of the literature and their particular research plan. 0 cr. Prerequisite or Corequisite: enrolment in the Modelling and Computational Science PhD program.

MCSC 7002G PhD Research. This is a non-credit course that will be administered by the student's supervisor. Students in the course are required to make satisfactory progress in their research, keep up to date with the literature on the current state of knowledge on their particular research and provide regular updates on their progress to their advisor. Students who make satisfactory progress with their thesis research will be able to continue in the program and enrol in this course the following year. Students are

required to register for this course every year. 0 cr. Prerequisite: good standing in the PhD program.

MCSC 7003G PhD Dissertation. The dissertation is the primary component of the PhD degree requirement. The research must lead to an original contribution of knowledge in the field, which must be reported fully in the candidate's dissertation. The research is carried out under the direction of the candidate's supervisor or co-supervisors in co-operation with a supervisory committee. This thesis will be accompanied by an oral thesis defence. 40 cr. Prerequisite: good standing in the PhD program.

MCSC 7210G Advanced Topics in Mathematical Modelling. This course builds on the core course Mathematical Modelling and elaborates on some of its topics in greater detail. In addition, it introduces a variety of special topics in applied mathematics with a focus on industrial and natural processes and phenomena. The topics will be chosen according to the needs and demands of the students and the available faculty resources. Topics and application may include auto-correlation of data sets, bifurcations in time-series, embedding time series, modelling stochastic systems, perturbation methods for partial differential equations, travelling wave phase plane, advanced reaction-diffusion phenomena and transition layers, Hausdorff measures, fractal dimension, Belousov-Zhabotinsky reaction, analysis of heartbeat time-series, fractals in science and medicine, chaotic dynamics in symmetric coupled cell systems, time series in the stock market and other financial products. 3 cr. Prerequisite: MCSC 6010G.

MCSC 7220G Advanced Topics in Numerical Analysis. This course explores recent problems in numerical analysis that are at the forefront of current research. The main objective of the course is to familiarize students with contemporary theoretical results and practical algorithms as preparation for doctoral research. The topics are chosen according to the needs and demands of the students. Potential topics include: level-set methods, finite element methods, finite volume methods, spectral methods, numerical optimization, multigrid methods, numerical linear algebra, Krylov subspace methods, preconditioning iterative methods. 3 cr. Prerequisite: MCSC 6020G.

MCSC 7230G Advanced Topics in High-Performance Computing. This course explores recent topics in high performance computing that are at the forefront of current research. The main objective of the course is to familiarize students with contemporary implementations and practical algorithms as preparation for doctoral research. The topics are chosen according to the needs and demands of the students. Potential topics include distributed computing, cluster computing, grid computing, numerical linear algebra for high-performance computers, domain decomposition methods and parallel preconditioners. 3 cr. Prerequisite: MCSC 6030G.

MCSC 7240G Advanced Topics in Dynamical Systems. This course builds on the topics covered in MCSC 6140G. The course covers advanced material, including recently developed tools, for the analysis of dynamical systems. By the end of the course, students are expected to be able to perform a bifurcation analysis of models that they will encounter in research or industry, including judging when such analysis is appropriate, choosing the right tools and interpreting the results. The topics are chosen according to the needs and demands of the students. Potential topics include equivariant bifurcation theory and applications; bifurcations in delay and partial differential equations; numerical continuation of bifurcations for ordinary, delay and partial differential equations; and bursting in biological phenomena and other systems. 3 cr. Prerequisites: MCSC 6140G, MCSC 6020G.

MCSC 7250G Advanced Topics in Fluid Dynamics. In many industrial applications, fluid flows need to be described with advanced models and methods, owing to the complexity of the physical system. Such advanced models typically go beyond standard fluid mechanics theory such as Navier-Stokes equations or flow instabilities. This course will introduce a range of advanced approaches to fluid flow modelling. A main focus will lie on recent progress in research and this will be addressed through term projects, based on journal articles. Special attention will be paid to flow in porous media, non-Newtonian fluids, micro and nanoflows, electro-kinetic transport phenomena, (Lattice) Boltzmann methods, and cellular automata and Monte Carlo simulations. 3 cr. Prerequisite or Corequisite: successful completion of all core courses.

MCSC 7270G Advanced Topics in Industrial Mathematics: Case Studies. Industrial mathematics is a branch of applied mathematics that is primarily concerned with the modelling and simulation of real world problems that have a commercial or societal interest. Driven by the problems under consideration, this field is highly interdisciplinary, drawing from physics, chemistry and biology with modern mathematical techniques used to bridge the gaps between them. In this course, the students will obtain important technical mathematics training and be exposed to a wide range of case studies problems in industrial mathematics covering a variety of techniques and applications. Whenever possible, the problem will originate from industry partners. Students work in groups on several problems throughout the term with a core faculty supervisor who is chosen appropriately for the problem. For each course project, students are required to complete a written report and an oral presentation. All case studies will be studied in teams. 3 cr. Prerequisite or Corequisite: successful completion of all core courses.

MCSC 7280G Advanced Topics in Computational Science. This course explores recent problems in computational science that are at the forefront of today's research. The main objective of the program is to bring students up to date with the current state of the art of computational science and make them ready for PhD research. The topics are chosen according to the needs and demands of the students and the availability of

faculty. Potential topics include computational cluster science; quantum computing: concepts, advantages and problems; and quantum Monte Carlo: applications in computational physics, advanced molecular simulations, advanced optimization and advanced Monte Carlo simulations. 3 cr. Prerequisites: MCSC 6010G, MCSC 6020G. Corequisites: as required by the subject matter; e.g., MCSC 6170G Computational Chemistry, MCSC 6180G Computational Physics, MCSC 6165G Monte Carlo Methods.

MITS 5100G Law & Ethics of IT Security. This course covers the many ways in which commercial law applies to information technology security. As more and more business transactions and communications are now conducted electronically, the IT function within an institution has become the custodian of the official business records. This course introduces the laws governing the daily business of an institution or government agency, as those laws apply to the protection of information and computer systems. Emerging issues, such as privacy and information disclosures, will be discussed in the course. 3 cr.

MITS 5200G Advanced Communication Networks. This course provides a detailed technical presentation of important networking concepts and protocols used in modern communication network architecture. Descriptions of the principles associated with each OSI network layer is provided with many examples drawn from the Internet and wireless networks. The TCP/IP protocol stack will be discussed in detail with a variety of examples on its various layers. Network addressing design is discussed. Particular attention is given to performance analysis of ARQ techniques and access methods, and network delay and throughput analysis in WAN and LANs. Characteristics of LANs are discussed in detail. Various routing methods and algorithms are analyzed and compared. Modern backbone and transport technologies such as optical and wireless networks and advanced networking protocols such as ATM and MPLS are briefly discussed. This course is cross-listed with ENGR 5660G Communication Networks and CSCI 5300G Computer Communication Networks. 3 cr.

MITS 5300G Operating Systems Security. This course addresses theoretical foundations of IT Security and their implications on the design and operation of operating systems. Operating systems fundamentals are covered to provide a basis for the remainder of the course. The laboratory part of this course puts a particular focus on the Windows and Unix/ Linux operating systems. It provides an overview of the security risk and management of the specified operating systems and preventive efforts to use the security features built within the systems and third-party applications. Students become familiar with essential reference sources available on the subject of computer security, including organizations such as CERT. 3 cr.

MITS 5400G Secure Software Systems. One of the fundamental causes for most of the computer security problems is insecure software design and implementation. This

course takes a proactive approach to cover areas from the technical side of coding secure software to project management tasks. Common coding problems like buffer overflows, random number generation and password authentication are addressed. A secondary focus is placed on a software design process; it needs to be set up so that security is built in at the very early stages, considered throughout the design process and not patched in at a later point of time. From the emerging security technology side, this course also introduces the topics of the eXtensible Markup Language (XML) and a portfolio of related security and privacy standards such as XML Signature, XML Encryption, XML Key Management, WS-Security, SAML, XACML and P3P in response to the growing need for a platform-independent language for supporting interoperable secure software infrastructure. Strategy and policy topics on how to find the right balance between security and usability are addressed as well as the management of a secure software system. 3 cr.

MITS 5500G Cryptography and Secure Communications. Protecting information assets is certainly important to the secrecy, integrity and availability of systems. Indeed, the need for secure communications is more profound than ever, recognizing that the conduct of much of our commerce and business is being carried out today through the medium of computers and digital networks. This course is on cryptography, the umbrella term used to describe the science of secure communications. In this course, students with strong mathematical backgrounds learn the details about the transformation of a message into ciphertext form by encryption and the recovery of the original message by decryption. This course describes the cryptographic mechanisms through which confidentiality, integrity, availability, authentication and message signature can all be provided. Furthermore, the course explores the basics of malware and defence mechanisms while touching on general aspects of intrusion prevention and detection. This course is cross-listed with ENGR 5670G Cryptography and Secure Communications, and CSCI 5310G Cryptography and Secure Communications. 3 cr.

MITS 5600G Security Policies and Risk Management. This course concerns the role and importance of risk management and security policies. It describes how attackers exploit the interactions between computer systems and their environment in order to learn how to prevent, detect and respond to such attacks. It will also discuss broader business-related security issues such as business continuity, incident recovery and legal issues related to security policies and risk management. Current technologies to aid in implementing security policies and risk management plans will be discussed throughout the course. 3 cr.

MITS 5610G Special Topics in IT Security. This course focuses on topics in IT Security that are not currently covered by the other courses in the program. Topics may vary depending on the interest of the students and the availability of faculty. A detailed description of the course content will be posted before the start of term. 3 cr.

MITS 5620G Special Topics in IT Management. This course focuses on topics in IT Management that are not currently covered by the other courses in the program. Topics may vary depending on the interest of the students and the availability of faculty. A detailed description of the course content will be posted before the start of term. 3 cr.

MITS 5900G MITS Seminar. Students are expected to participate in a series of seminars on current IT security related topics. All students will be required to attend a minimum of five seminars as set forth by the faculty, present a seminar on their capstone research projects upon completion and attend capstone seminars as presented by other MITS students. Students are encouraged to attend the METIS Security Seminar Series as part of the course requirements. This course will carry a pass/fail grade. 0 cr.

MITS 6100G Attack and Defence. The course covers the fundamental theories of vulnerabilities in network protocols, intrusion detections and defence against network attack. It discusses the latest cutting-edge insidious attack vectors and the patterns of denial-of-service attacks. This course also presents the tools needed to prevent attackers from gaining access and covering their tracks. This course examines and reviews various types of hacking tools and ways to strengthen the system or application against the attack. The course also discusses defences and attacks for Windows, Unix, switches, routers and other systems. 3 cr. Prerequisites: MITS 5200G and MITS 5300G.

MITS 6300G IT Security Capstone Research Project I. This course provides students with an opportunity to gather knowledge and skills learned from the program coursework and to conduct a research project with industrial applications. Students are expected to do a research literature review and to develop a set of hypotheses for a research project in IT security. A research proposal outlining hypotheses and alternative remedies to the problem should be submitted to the research faculty advisor by the end of the course semester. 3 cr. Prerequisite: nine credit hours in MITS courses or permission from instructor.

MITS 6400G Biometrics/Access Control and Smart Card Technology. This course discusses in detail the theoretical constructs around Access Control and provides an overview of the fundamental background. Traditionally, most security systems authenticate users based on something they know, like a password. However, where security really matters, it makes sense to add a second layer such as a smartcard. A third option, and probably the most authentic method, is something that, at least theoretically, is virtually impossible to forge. This course discusses biometric controls. Biometrics is generally the study of measurable physical characteristics and behavioural patterns. The course deals with various authentication techniques, their effectiveness, cost, intrusiveness and accuracy. 3 cr.

MITS 6600G IT Security Capstone Research Project II. The research outlined in the MITS 6300G proposal should be completed during this course. The final report of the research findings and recommendations for the problem addressed should be submitted to the research faculty advisor along with a presentation of the results. The results should have direct practical applications and/or be publishable in refereed publications. 3 cr. Prerequisite: MITS 6300G.

MTSC 6000G Graduate Seminar in Science Communication I (non-credit). The goal of this course is to assist students in developing the skills necessary to effectively communicate technical information to a diverse scientific audience. Seminars by second-year students also expose students to the range of research carried out within the program. A series of oral and written exercises are each followed by constructive review by both peers and faculty. Early in the course, speaking exercises include a 10-minute presentation to the class on a basic topic in the student's discipline. Towards the end of the course, students make a 25-minute presentation on a journal article. Writing exercises include abstracts of seminars by second-year students and a brief discussion of a journal article. Evaluation focuses on clarity, precision and the care with which the audience is guided to the presenter's objective. The student will receive a grade of either pass or fail. 0 cr.

MTSC 6010G Physics and Chemistry of Materials. This one-semester course examines in depth the fundamental principles and concepts used by physicists and chemists to describe materials. It covers scientific and practical interrelations in physics, chemistry and biology of materials, emphasizing the structure, physical and chemical properties of all classes of materials. 3 cr. Prerequisite: In light of the interdisciplinary nature of the program, all students should have completed at least one full year of study in undergraduate physics, chemistry and mathematics (to the level of differential and integral calculus). Some exposure to quantum mechanics is desirable.

MTSC 6020G Advanced Topics in Materials Science. In this one-semester course, specialized topics relevant to individual faculty in the program (but of potentially broad interest) are taught in a modular fashion. Topics may be selected from those involving the structure and properties of materials related to atomic, molecular, crystalline structures and their electron properties. The course also highlights the processing, properties and uses of a broad class of materials for a variety of applications. 3 cr. Prerequisite: MTSC 6010G.

MTSC 6050G MSc Thesis. The graduate thesis is an original work and is the major component of the MSc program. The thesis research is carried out under the direction of the student's supervisor; it involves an investigation of a research topic with the possibility of leading to a peer-reviewed article. Through the thesis, candidates are expected to give evidence of competence in research and a sound understanding of the

area of specialization. Students must prepare and successfully defend a written thesis at the end of the program related to the research they have undertaken. The thesis is evaluated by an examining committee and includes an oral presentation and defence. The student must receive a satisfactory report on the written thesis and its oral presentation and defence, and must demonstrate a thorough understanding of the research topic. The student will receive a grade of either pass or fail. 18 cr. Prerequisite: enrolment in the Materials Science graduate program.

MTSC 6100G Graduate Seminar in Science Communication II (non-credit). The goal of this course is to further the students' development of strong scientific communication skills. Students make a 30-minute presentation of their research to all students in both the first and second years of the program and answer questions. Students evaluate their peers' presentations and receive both peer and faculty reviews of their own presentations. Students will receive a grade of either pass or fail. 0 cr.

MTSC 6110G Thermodynamics and Statistical Mechanics of Materials. This one-semester course provides a comprehensive introduction to thermodynamics and statistical mechanics of materials, such as semiconductors, amorphous and soft materials, liquids and their mixtures, polymers and inhomogeneous materials. The course covers phase transitions and phase equilibrium, order-disorder phenomena, point defects in crystals and the statistical thermodynamics of interfaces. Nonequilibrium thermodynamics is briefly introduced. The course provides the background knowledge for students to read the literature in the field and to use it in their research. 3 cr. Prerequisites: undergraduate thermodynamics, statistical mechanics and satisfaction of admission requirements for the MSc program.

MTSC 6140G Experimental Techniques in Materials Characterization. This one-semester course is a techniques-oriented course covering high resolution experimental solid-state characterization. The course includes theoretical background but focuses on practical aspects of techniques. Content includes bulk, surface and molecular characterization. Where practical, demonstrations and hands-on operation of specific instruments are included. 3 cr. Prerequisite: good standing in program.

MTSC 6220G Advanced Photovoltaics and Solar Energy Physics. This one semester course will cover the following areas: i) fundamentals of PV devices and systems; ii) new materials and technologies for solar cell; and iii) the economy of photovoltaics. Part i) will look at the basic physics behind a solar cell operation from an opto-electronic and a thermodynamic point of view. In part ii), the course will cover the evolution from first generation to third generation photovoltaics (and beyond) and will examine alternative solutions being studied to improve cost and efficiency of solar cells. Finally, part iii) of the course will consider the economic implication of the different choices of materials and technologies. 3 cr. Prerequisite: MTSC 6010G.

MTSC 6230G Physics of Non-Crystalline Materials. The course will focus on the optoelectronic properties of non-crystalline materials, particularly semiconductors. Particular emphasis will be given to the physics and applications of hydrogenated amorphous silicon on the computational approaches for modeling and simulation, including an analysis of pseudopotential methods vs. ab initio based methods. 3 cr. Prerequisite: MTSC 6010G.

MTSC 6240G Biomaterials. This course provides an introduction to naturally derived materials and their applications. The properties of materials of animal and plant origins and the potential uses of these materials will be discussed in the first part of the course. The second half of the course will explore the application of biotechnology to manipulate and create novel materials that are not normally found in nature. 3 cr. Prerequisites: undergraduate Chemistry or Biology.

MTSC 6260G Topics in Applied Materials Science I. This course focuses on topics that may vary depending on the interests of the students and the availability of faculty. Each course may focus on a different topic, allowing students to take both courses if they wish and if this is approved by their supervisory committee. Some suggested topics are nanotechnology, optical applications, electrochemistry and mass transport in fuel cells. 3 cr.

MTSC 6270G Topics in Applied Materials Science II. This course focuses on topics that may vary depending on the interests of the students and the availability of faculty. Each course may focus on a different topic, allowing students to take both courses if they wish and if this is approved by their supervisory committee. Some suggested topics are nanotechnology, optical applications, electrochemistry and mass transport in fuel cells. 3 cr.

MTSC 6330G Electrochemical Methods and Materials. This course will concentrate on the principles and theory of dynamic electrochemistry, voltammetry, stripping analysis, electrochemical sensors and detectors. This course includes an overview of electroanalytical methods along with an in-depth treatment of mass transport and electron transfer kinetics. In addition, advanced electrode materials and electrode/cell designs will be covered. 3 cr. Prerequisite: satisfactory standing in the program.

MTSC 6510G Surface Science and Catalysis. This course is one-semester long. It covers the fundamental science required to understand the atomic and electronic structure of surfaces and their chemical reactivity, and the most common tools for surface characterization. 3 cr. Prerequisite: MTSC 6010G.

MTSC 6520G Nanomaterials. This course will introduce students to the relevant concepts governing the synthesis, science and engineering of nanomaterials. The course will also examine characterization methods at the nanoscale, new properties at

the nanoscale and existing and emerging applications of nanomaterials. 3 cr. Prerequisite: satisfactory standing in the program.

MTSC 6530G Carbon Based Materials. The course examines the present state of processing, properties and application of carbonaceous materials. Old and new forms of carbon will be introduced, including coke from coal and petroleum, natural and artificial graphite, carbon blacks, activated carbons, synthetic diamonds, diamond-like carbon, fullerenes and carbon nanotubes. Emphasis will be placed on novel carbon forms such as CVD diamond, carbon nanotubes and amorphous carbon films. In addition, the physicochemical and surface chemical properties of several forms of carbon will be examined in detail. 3 cr. Prerequisite: satisfactory standing in the program.

MTSC 6610G Computational Physics. The course introduces the fundamental principles which form the basis of modern HPC simulations in physics of materials, their realization in the form of various numerical algorithms and their applications to different problems. The main focus is advanced methods of studying quantum mechanical and statistical mechanical systems. Approaches considered will include density functional theory, molecular dynamics and Monte Carlo. The course introduces principles, concepts, methods, techniques, algorithms and tools for solving various physical problems with numerical and approximate solutions. This will be discussed in conjunction with selected topics from Computational Materials Science. This course is cross-listed with MCSC 6180G Computational Physics. 3 cr. Prerequisites: undergraduate quantum mechanics and statistical mechanics, and satisfaction of admission requirements for the MSc program.

MTSC 6620G Theory of the Solid State. This course develops the theoretical foundations of a variety of condensed matter systems at a higher level of mathematical sophistication than earlier in the curriculum. 3 cr. Prerequisite: MTSC 6010G

MTSC 6710G Computational Chemistry. The course introduces the fundamental principles underlying different methods from classical to quantum theories and from first principles through to the latest advances in the area. The main focus is on understanding and theoretical modeling of molecular structures, chemical reactions, bonding and energetics. Molecular properties and relativistic methods are also covered. This course is cross-listed with MCSC 6170G Computational Chemistry. 3 cr. Prerequisites: introductory quantum mechanics and undergraduate mathematics, MCSC 6010G and MCSC 6020G, or permission from the instructor.

MTSC 6720G Hydrogen Based Energy Systems and Fuel Cells. This course explores hydrogen as an energy carrier and its conversion in hydrogen fuel cells. The focus is on polymer electrolyte fuel cells, but the course includes a brief discussion of phosphoric acid, alkaline and solid oxide fuel cells as well as other types of fuel sources

such as methanol or natural gas. The thermodynamic aspects of a hydrogen economy are discussed, encompassing production (reforming, electrolysis), storage (compression, solid matrix), transportation and usage in fuel cells. With regards to fuel cells, the main focus will be on general operating principles, electrochemistry, thermodynamics (efficiency, losses), and mass and heat transport phenomena, including ion flow. A general picture of i) current scientific challenges; and ii) device modelling of fuel cells will emerge. 3 cr. Prerequisite: satisfactory standing in the program.

MTSC 6820G Polymer Science & Engineering. The course introduces the fundamental characteristics of polymers, visco-elasticity and non-Newtonian fluid mechanics. It describes the effects of temperature, crystallinity and diffusivity on polymer processing and properties. 3 cr. Prerequisites: MTSC 6010G and undergraduate mathematics.

MTSC 7000G PhD Thesis Proposal and Candidacy Exam. Students in the Materials Science PhD program will be required to submit a comprehensive thesis proposal outlining their research objectives and preliminary results. This thesis proposal also will consist of a literature review that addresses the current state of knowledge of their particular research topic. This course will consist of an oral candidacy examination that evaluates the student's grasp of the literature and their particular research plan. 0 cr. Prerequisite: enrolment in the Materials Science PhD program.

MTSC 7001G PhD Research. This is a non-credit course that will be administered by the student's supervisor. Students in the course are required to make satisfactory progress in their research, keep up to date with the literature on the current state of knowledge on their particular research and provide regular updates on their progress to their advisor. Students who make satisfactory progress with their thesis research will be able to continue in the program and enrol in this course the following year. Students are required to register for this course every year. 0 cr. Prerequisite: good standing in the Materials Science PhD program.

MTSC 7002G PhD Dissertation. The dissertation is the primary component of the PhD degree requirement. The research must lead to an original contribution of knowledge in the field which must be reported fully in the candidate's dissertation. The research is carried out under the direction of the candidate's supervisor or co-supervisors in co-operation with a supervisory committee. This thesis will be accompanied by an oral thesis defence. Prerequisite: good standing in the Materials Science PhD program.

MTSC 7210G Advanced Topics in Materials Physics. This course will explore a range of research topics in materials physics through examples selected from the current scientific literature. 3 cr. Prerequisite: satisfactory standing in the program.

MTSC 7310G Advanced Topics in Materials Chemistry. This course will explore a range of research topics in materials chemistry through examples selected from the current scientific literature. 3 cr. Prerequisite: satisfactory standing in the program.

MTSC 7410G Advanced Topics in Computational Science. This course teaches specialized computational techniques used in HPC simulations of materials. The course will introduce students to advanced methods used to model quantum-mechanical and statistical mechanical systems. This course focuses on materials and/or physical properties that cannot be adequately modeled using the standard methods described in the introductory Computational Physics course (MTSC 6610G). Topics will vary based on the expertise of the instructor and the needs of the students. 3 cr. Prerequisites: MTSC 6610G and enrolment in the PhD Program.

MTSC 7420G Advanced Topics in Theoretical Materials Science. This course builds on the foundations introduced in MTSC 6620G Theory of the Solid State. The goal of the course is to give students a detailed understanding of specific physical theories that are directly relevant to advanced materials. Topics will vary based on the expertise of the instructor(s) and the needs of the students. Prerequisite: MTSC 6620G Theory of the Solid State or permission from the instructor. 3 cr.

MTSC 7510G Advanced Topics in Biomaterials. This course will explore a range of research topics in biomaterials through examples selected from the current scientific literature. 3 cr. Prerequisite: satisfactory standing in the program.

NUCL 5001G MASc Thesis. The thesis is the major component of the MASc program and is carried out under the direction of the student's supervisor. The thesis may involve an investigation, which is fundamental in nature or applied, and may incorporate elements of analysis, design and development. Through the thesis, candidates are expected to give evidence of competence in research and a sound understanding of the area of specialization involved. The student will receive a grade of either pass or fail. 15 cr.

NUCL 5003G Seminar. Students are required to participate in a program of seminars led by internal and external speakers on current research topics. All MASc students are required to give a seminar on their thesis research during the second year of their program. The student will receive a grade of either pass or fail. 0 cr.

NUCL 5004G Directed Studies. Faculty permission may be given for supervised research and development projects, individual study or directed readings. Students wishing to pursue a course of directed studies must, with a faculty member who is willing to supervise such a course, formulate a proposal that accurately describes the course content, the learning goals, the intended method and extent of supervision, and

the method(s) by which the student's work will be evaluated. This course may only be taken once. 3 cr.

NUCL 5005G Special Topics. The course covers material in an emerging area or in a subject not covered in regular offerings. This course may be taken more than once, provided the subject matter is substantially different. 3 cr.

NUCL 5006G Industrial Research Project. Students enrolled part-time in a course-based MEng program may designate a period of approximately four months in an industrial laboratory to carry out an industry-oriented project under the supervision of a suitably qualified staff engineer or scientist, and a university co-supervisor. The university works with the candidate and consults the candidate's employer to arrange a suitable industrial project. A satisfactory project topic and appropriate arrangements are required for the project to be approved by the university, and it is possible that in some cases this may not be feasible. Upon completion, the candidate is expected to submit a substantial report on the project and to make a presentation at the university. The industrial research project can only be undertaken after at least half the required courses have been taken. The student will receive a grade of either pass or fail. 6 cr.

NUCL 5009G Graduate Research Project. The MEng Graduate Research Project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The chosen topic is dependent on the area of specialization of the student. To complete the research project, students will use resources normally available on campus. The student will receive a grade of either pass or fail. 9 cr.

NUCL 5010G Project Management for Nuclear Engineers. This course in project management prepares nuclear engineers and scientists in the application of this discipline in their work. It is an intensive investigation into the major principles of project management slanted towards, but not exclusively about, the management of nuclear engineering projects. The course uses the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) as a skeleton and expands that coverage with relevant examples from nuclear, software and general engineering. Special emphasis is placed on risk management, particularly in the area of safety-critical projects. Graduates will be well positioned both to apply the knowledge in their area of engineering and to sit the PMI's Project Management Professional (PMP) examination. The course is taught using many case studies from industry and engineering. 3 cr.

NUCL 5020G Mathematical Methods in Nuclear Applications. Numerical analysis is the study of computer algorithms developed to solve the problems of continuous mathematics. Students taking this course gain a foundation in approximation theory, functional analysis and numerical linear algebra from which the practical algorithms of

scientific computing are derived. A major goal of this course is to develop skills in analyzing numerical algorithms in terms of their accuracy, stability and computational complexity. Topics include best approximations, least squares problems (continuous, discrete and weighted), eigenvalue problems and iterative methods for systems of linear and nonlinear equations. Demonstrations and programming assignments are used to encourage the use of available software tools for the solution of modelling problems that arise in physical, biological, economic or engineering applications. 3 cr.

NUCL 5030G Transport Theory. This course is a general introduction to transport theory. Continuous medium transport and discrete particle transport are presented in a unified manner through the use of the probability distribution function. Various types of transport problems are presented together with analytic solutions. Approximate and numerical methods are also covered. This course is cross-listed with MCSC 6160G Transport Theory. 3 cr. Prerequisites: undergraduate knowledge of Linear Algebra, Differential Equations, Vector Calculus.

NUCL 5040G Monte Carlo Methods. This course provides an introduction to simulation of stochastic processes using Monte Carlo methods. The emphasis of the course is Monte Carlo solution to the Boltzmann transport equation, specifically for radiation transport. Other applications of Monte Carlo analysis are introduced. These include, but are not limited to, molecular dynamics, statistical physics, biophysics and queuing theory. Concepts presented will include pseudorandom number and random variate generation, direct simulation of physical processes, Monte Carlo integration and variance reduction, detector response and estimators, and Monte Carlo optimization. This course is cross-listed with MCSC 6165G. 3 cr. Prerequisites: undergraduate theory of ordinary and partial differential equations and introductory statistics.

NUCL 5050G Applied Risk Analysis. This course presents principles and methods for assessing and managing technological risks. The following subjects are covered: probability theory; failure rates; availability; reliability; test frequencies; dormant and active systems; initiating events; fault trees and event trees; dual failures; defence in depth; principle of control, cool, contain; accident prevention, mitigation and accommodation; separation and independence; redundancy; common mode events; safety culture; safety analysis techniques; inherent safety features; plant safety systems; probability evaluation for simple systems; quantitative and probabilistic safety assessment; calculation of frequency and consequences of power plant accidents; risk-based decision making; and risk-based regulation. Applications include aerospace, energy and nuclear systems safety analysis. 3 cr.

NUCL 5060G Nuclear Concepts for Engineers and Scientists. The course is a fast introduction to atomic, nuclear and reactor physics for graduate students without an adequate background in these areas. Topics covered include nuclear structure,

radioactivity, interaction of radiation with matter, neutron flux, neutron diffusion, nuclear reactors and reactor kinetics. 3 cr. Prerequisites: undergraduate knowledge of Differential Equations, Partial Differential Equations, Vector Calculus. This course is not available to students who graduated from an undergraduate program in the Faculty of Energy Systems and Nuclear Science.

NUCL 5065G Thermalhydraulics Concepts for Engineers and Scientists. The course is a graduate-level introduction to thermalhydraulics for students without an adequate background in this area. Topics include fluid mechanics, thermodynamic cycles and heat transfer, fluid statics, elementary fluid dynamics and fluid kinematics, finite control volume analysis and differential analysis of fluid flow, similitude, dimensional analysis and modelling, viscous flow in pipes and flow over immersed bodies. 3 cr. Prerequisites: undergraduate courses in mathematics and physics.

NUCL 5070G Environmental Modelling. The transport of pollutants through the total environment depends upon complex interactions between the atmosphere, geosphere and hydrosphere. Understanding the details of pollutant transport between source, environmental compartments and receptors allows for determination of potential dose and thereby estimation of risk. This course explores the fundamental theory, equations and solutions to standard environmental transport models (with emphasis on radiolonuclide transport). In addition, this course introduces the student to the RESRAD codes for environmental modelling. 3 cr. Prerequisites: undergraduate courses in physics, chemistry, differential equations and statistics. A working knowledge of MS EXCEL is required.

NUCL 5080G Advanced Topics in Environmental Degradation of Materials. Predicting the corrosion performance-lifetime of components is an ongoing area of interest in maintaining nuclear power plants. Unexpected or premature degradation of components often occurs by localized corrosion processes such as pitting, crevice or stress-assisted corrosion. In this course, current theories of various localized corrosion mechanisms, current practices for measuring and identifying corrosion processes, models and methodologies for predicting the occurrence of localized corrosion and the application of this knowledge to specific aspects of the nuclear fuel cycle are examined. 3 cr. Prerequisite: undergraduate course in corrosion.

NUCL 5090G Occupational Health and Safety. This course explores the often neglected, although highly important, subject of occupational health and safety as it relates to industrial operations and complex processes. Concepts such as hazard avoidance, health and environmental control, machine guarding, electrical hazards and process safety will be discussed. In addition, management and institutional controls for workplace safety will be considered, such as communicating vital information, pre-task briefings and shift turnovers. Case studies and lessons learned from numerous

industrial and manufacturing industry accidents will be used to highlight important information. 3 cr. Prerequisites: undergraduate courses in physics, differential equations and statistics.

NUCL 5100G Nuclear Plant Systems and Operation. A combination of lectures and self-paced interactive CD are used to present the key design and operating features of a CANDU generating unit, including the principles of overall unit operation and control; the functions, equipment and operation of the main process systems; how each major system is controlled; and how reactor safety and the protection of the public is achieved. Students gain familiarity with the conduct of normal and abnormal operations on a simulated CANDU generating unit, including power manoeuvres; poison override operations; recoveries from reactor trips; recoveries from turbine trips; and responses to reactor, heat transport, steam and feed-water system malfunctions. 3 cr. Credit restrictions: ENGR 4640U, UN 0801.

NUCL 5120G Design of Nuclear Plant Systems. The course presents the main design and operating features of nuclear power plants, including the plant life cycle; plant layout; and the key steps in the process of nuclear plant design, including the design and operation of unit control schemes, shutdown and safety systems, reactor cooling, shutdown and emergency core cooling systems, steam generator design features, level and pressure control, turbine and generator, feedheating systems, unit electrical, service water and air systems, the fuel handling and storage systems. Where appropriate, nuclear power plant simulators are used to demonstrate the key design features of plant systems and unit behaviour, including those using pressurized and boiling light water; pressurized heavy water and gas cooled reactors; and small, medium and large reactors. 3 cr. Credit restriction: ENGR 4700U.

NUCL 5130G Nuclear Design Processes and Techniques. The course presents the key principles and practices that are essential to the successful conduct of nuclear design processes and techniques so as to ensure the safe and reliable operation of the designed systems and the overall power plant. Emphasis is placed on understanding and applying nuclear safety design concepts; quality management principles and codes; the application of standards and regulations to the design of equipment and systems; the practice of establishing safety and engineering requirements; overseeing and accepting engineering work by others; applying human performance management principles and practices for the management of knowledge work; interfacing between design, commissioning, testing and operation groups; and applying techniques to deal with emergent problems. 3 cr.

NUCL 5200G Reactor Physics. The course is a graduate-level treatment of reactor physics, with emphasis on reactor statics. Topics covered include static neutron balance equations, neutron slowing down, resonance absorption, multi-group transport and

diffusion equations, homogenization methods and variational methods. Lattice and full-core numerical methods are also covered. 3 cr. Prerequisites: undergraduate courses in linear algebra, differential equations, vector calculus.

NUCL 5210G Advanced Reactor Physics. The course is a graduate-level treatment of reactor physics, with emphasis on reactor dynamics. Topics covered include point kinetics, space-time kinetics, perturbation and generalized perturbation theory, fuel depletion, fission product poisoning and elements of reactor control. 3 cr. Prerequisite: NUCL 5200G Reactor Physics.

NUCL 5215G Advanced Reactor Engineering. The course is comprised of advanced topics in nuclear engineering, with emphasis on reactor physics. Topics covered include neutron slowing down, resonance absorption, multigroup transport and diffusion equations, reactor kinetics and homogenization methods. Lattice and full-core numerical methods are also covered. This course is cross-listed with ENGR 5180G Advanced Nuclear Engineering. 3 cr. Prerequisites: undergraduate knowledge of linear algebra, differential equations, vector calculus.

NUCL 5220G Fuel Management in Nuclear Reactors. Nuclear fuel cycles are studied from mining to ultimate disposal of the spent fuel, including the enrichment processes and the reprocessing techniques from a point of view of the decision-making processes and the evaluation of the operational and economical consequences of these decisions. For the steps within the fuel cycles, the method of determining the associated costs, in particular those relevant to the disposal of nuclear waste and the overall fuel cycle costs, are described. Burn-up calculations are performed for the swelling time of the fuel within the reactor core. The objectives and merits of in-core and out-of-core fuel management for CANDU Pressurized Heavy Water Reactors (PHWR) and Light Water Reactors (LWR) are analyzed in detail for the refuelling equilibrium as well as for the approach to refuelling equilibrium. The course also covers fuel management for thorium-fuelled CANDU reactors and other advanced fuels such as MOX containing plutonium from discarded nuclear warheads and DUPIC (Direct Use of PWR fuel in CANDU reactors). The fuel management problem is treated as an optimization problem with objective functions or performance indexes identified as well as decision variables and appropriate constraints (active and non-active). The course also includes a review of the major work done in this area along with the most important computer codes. 3 cr. Prerequisite: knowledge of reactor physics at the undergraduate level is recommended.

NUCL 5230G Advanced Nuclear Thermalhydraulics. This course expands on the importance of thermalhdyraulics in nuclear power plant design, operation and safety. Thermalhydraulic problems and solutions relevant to nuclear power plants and nuclear research reactors are discussed. The course discusses in detail mass, momentum and energy equations and explores various numerical techniques for solving these

equations, especially for applications to two-phase flow. Boiling, condensation, cavitation and waterhammer problems are discussed. Special topics of recent interest such as impact of ageing phenomena and application of electrohydrodynamic and magnetohydrodynamic forces are presented. 3 cr. Prerequisites: undergraduate courses in fluid mechanics and heat transfer.

NUCL 5240G Heat Transfer in Nuclear Reactor Applications. This course discusses advance heat transfer phenomena related to nuclear reactors in both current and future designs. Topics include heat transfer phenomena (conduction, convection, radiation), boiling and condensation phenomena, critical heat flux and boiling crisis, supercritical fluids, correlations for heat transfer at high pressure and high temperature, and advanced numerical methods. 3 cr. Prerequisite: undergraduate course in heat transfer.

NUCL 5250G Power Plant Thermodynamics. This course presents the theoretical and practical analysis of the following, with particular reference to CANDU plants. Thermodynamic Cycles: nuclear versus conventional steam cycles, regenerative feedwater heating, moisture separation and reheating, turbine expansion lines, heat balance diagrams, available energy, cycle efficiency and exergy analysis; Nuclear Heat Removal: heat conduction and convection in fuel rods and heat exchanger tubes, heat transfer in boilers and condensers, boiler influence on heat transport system, boiler swelling and shrinking, boiler level control, condenser performance; and Steam Turbine Operation: turbine configuration, impulse and reaction blading, blade velocity diagrams, turbine seals and sealing systems, moisture in turbines, part load operation, back pressure effects, thermal effects and turbine governing.
3 cr. Prerequisite: undergraduate course in thermodynamics.

NUCL 5260G Reactor Containment Systems. This course covers the design and main operating features of nuclear reactor containment systems, considering both normal and accident conditions. The course includes definition and purpose of containment, design requirements and considerations, a survey of containment designs in actual use and the use of simulation for safety analysis and design. 3 cr. Prerequisite: undergraduate course in thermodynamics.

NUCL 5270G Control, Instrumentation and Electrical Systems in CANDU based Nuclear Power Plants. This course covers the basic control, instrumentation and electrical systems commonly found in CANDU based nuclear power plants. The course starts with an overall view of the dynamics associated with different parts of the plant, i.e., reactor, heat transport systems, moderator, steam generator, turbine, and electrical generator. Based on such knowledge, the control and regulation functions in the above systems are then defined. Different instrumentation and measurement techniques are examined, along with control strategies. The time and frequency domain performance characterizations of control loops are introduced with consideration of actuator and

sensor limitations. Different controller design and tuning methods and instrumentation calibration procedures are discussed. Two modes of operation of CANDU plants will be analyzed, i.e., normal mode and alternate mode. Advanced control technologies, such as distributed control systems and field bus communication protocols, are introduced in view of their potential applications in the existing and newly constructed CANDU power plants. The electric systems in the CANDU plant are examined. The modelling of the dynamics and control devices for the generator are covered in detail. The dynamic interaction between the power plants and the rest of the electric power grid with other generating facilities and various types of loads are studied. 3 cr. Prerequisite: undergraduate course in process control.

NUCL 5275G Safety Instrumented Systems (SIS). Safety is an essential part of nuclear and energy systems. This course covers fundamentals of safety engineering, including safety system design and safety instrumented systems. Safety assessment techniques are used to evaluate failure modes scenarios and to design and validate nuclear safety systems. This is achieved through the review of previous nuclear accidents and possible failure scenarios. Environmental and other external fault scenarios are discussed and assessed to design and validate appropriate safety systems. Students will also design and validate recovery and shutdown systems for disaster and severe accident scenarios, and design safety systems for control of nuclear releases with the analysis of health and environment. 3 cr. Prerequisites: undergraduate courses in radiation, health and nuclear reactor design.

NUCL 5280G Advanced Reactor Control. This course presents the state-variable approach and the application of various state-space techniques to reactor dynamics and control. Topics include state variables and the concept of the system state; stability in the state space; various definitions of stability; the second method of Liapunov; stability of nuclear systems; centralized versus distributed control; analogue and digital control; hardware and software; licensing requirements; computers in shutdown systems; and applying the principles of separation, diversity and redundancy. 3 cr. Prerequisite: undergraduate course in control theory.

NUCL 5285G Advanced Process Control Systems. Control systems are the brain of production plants. This course enables students to review process control foundations and practice advanced process control systems as applied on nuclear and energy production systems. Students practice process modelling and simulation of dynamic systems and apply to selected control design projects. Advanced programmable logic controllers and distributed control systems (DCS) and implementation in industrial projects are explained. Examples of spatial flux, reactivity and reactor shutdown control systems are discussed in selected design projects. 3 cr. Prerequisite or corequisite: undergraduate course in control, instrumentation and safety design, such as ENGR 3740.

NUCL 5290G Advances in Nuclear Power Plant Systems. A combination of lectures, self-paced interactive CD-ROM study and the use of power plant simulators imparts to students the advances in the key design and operating features of the main nuclear power plant types, including reactors using pressure vessels and pressure tubes, pressurized water, boiling water and gas cooled reactors; the use of natural versus enriched fuel, converters and breeders; overall plant control systems, load following capabilities and islanding operations; safety systems; and responses to abnormal and emergency events. Nuclear plant simulators are used throughout the course. 3 cr. Prerequisite: undergraduate course in power plant systems.

NUCL 5300G Advanced Topics in Radioactive Waste Management. This course examines the various international approaches used for the development of publicly acceptable radioactive waste disposal facilities. Particular emphasis is placed on the technical aspects of geologic disposal systems, used/recycled fuel disposal and the assessment of radioisotope release. The influence of public acceptance on the selection and implementation of technical solutions is also considered. 3 cr. Prerequisite: undergraduate course in radioactive waste management.

NUCL 5310G Transmutation of Nuclear Waste. The course is a graduate-level treatment of nuclear waste. Topics covered include a brief historical summary on nuclear energy; the problems with nuclear waste; spent fuel classification and radio-toxicity; current proposed management of spent fuel; technical background on the concept of transmutation, transmuters and their capability; nuclear data and calculation methods for transmutation; examples of facilities for nuclear transmutation; and practical options of transmutation. 3 cr.

NUCL 5350G Regulatory Affairs and Licensing Concepts. This course will describe the fundamentals of work in nuclear regulatory affairs. The roles and responsibilities of regulatory affairs staff will be described in detail. The course will describe the Nuclear Safety Control Act, current regulations, the role of the license, reportability, interface with safety analysis and design, issues management and regulatory communications. The course will also review Canadian regulatory practise to US and IAEA regulatory practise and the course will also identify the non-nuclear regulations that affect regulatory affairs at a Canadian nuclear facility. 3 cr.

NUCL 5400G Advanced Radiation Science. This course introduces advanced concepts in radiation engineering, with an emphasis on how ionizing radiation interactions with matter may be modelled. The course reviews fundamental particle interaction mechanics, measurement and detection of radiation, evaluation of nuclear cross sections and various solutions to the Boltzmann transport equation. This course is cross-listed with ENGR 5181G Advanced Radiation Engineering. 3 cr. Prerequisites: undergraduate courses in nuclear physics, radiation detection and the interaction of

radiation with matter, or NUCL 5060G Nuclear Concepts for Engineers and Scientists, differential equations and statistics.

NUCL 5410G Physics of Radiation Therapy. A study of the uses of various types of radiation for therapeutic applications, including X-rays, gamma radiation, electrons, neutrons, lasers, UV, visible, infrared, radiofrequency and microwaves. Topics include production of radiation for therapeutic purposes; external beam radiotherapy, brachytherapy, electron beam therapy, boron neutron capture therapy, heavy ion therapy and photodynamic therapy; therapeutic dose calculation and measurement; dose calculation algorithms, treatment planning, optimization and verification; equipment calibration; and dose impact on patients and workers. This course is cross-listed with RADI 4320 Therapeutic Applications of Radiation Techniques. 3 cr. Prerequisite: NUCL 5060G Nuclear Concepts for Engineers and Scientists, or equivalent.

NUCL 5420G Aerosol Mechanics. Aerosols, or particles suspended in the air, are generated from numerous processes and used in numerous ways. Some examples of commonly encountered aerosols are smoke from power generation, cigarette and forest fire; atmospheric aerosols causing ozone depletion, reduced visibility, rain, snow, cloud and fog; and respiratory deposition or drug delivery through respiratory system. Some aerosols cause significant health and environmental problems while others improve the quality of life. To prevent the formation of undesired pollutants or to produce materials of desired properties, it is important to understand the mechanics of aerosols. This course explores the properties, behaviour and measurement of airborne particulate. Concepts related to particle motion, particle size statistics, forces acting on particles, respiratory and mechanical filtration, and physicochemical properties of particles are discussed. Real-world examples of particle transport are used to reinforce the issues being discussed. 3 cr. Prerequisites: undergraduate courses in physics, chemistry, differential equations and statistics. A working knowledge of the MATLAB code is required.

NUCL 5430G Advanced Dosimetry. This course covers advanced concepts in radiation dosimetry linking fundamental radiation physics with metrological theory and practice for therapeutic, external and internal dosimetry. The course reviews basic radiation and charged particle interaction processes and the underlying quantities and units used in dosimetry and radiation monitoring. Cavity theory and the application of ionization chamber methods of dosimetry for photon and electron beams are covered, and a review of passive integrating dosimeters such as radiochromic film, chemical dosimeters and biological dosimetry is given. The properties and role of various pulse-mode detectors in dosimetry and monitoring are discussed along with the metrological relationship between measured quantities and effective dose. Internal dosimetry and dose assessment are studied in terms of in-vitro and in-vivo monitoring methods along with the standard codes and methods used for assessing dose from bioassay data. The

course concludes with a survey of dosimetry practice under special circumstances and environments, such as those encountered in space and in accident scenarios. 3 cr. Prerequisite: undergraduate course in dosimetry.

NUCL 5440G Advanced Radiation Biophysics and Microdosimetry. This course introduces advanced concepts in radiation biophysics with an emphasis on the stochastic nature of radiation interaction with biological systems and the microdosimetric analysis of radiation effects. The course reviews fundamental charged particle interaction processes and the measurement of radiation energy deposition on the microscopic and sub-microscopic scale and how this knowledge can be used to quantify radiation quality. Microdosimetric descriptions of radiation quality are also discussed in terms of low-dose radiation protection, medical applications of low Light Energy Transfer radiation and high LET radiation therapy as well as the special nature of radiation fields encountered in space. 3 cr. Prerequisites: undergraduate courses in nuclear physics, radiation detection and the interaction of radiation with matter or NUCL 5060G Nuclear Concepts for Engineers and Scientists.

NUCL 5450G Advanced Material Analysis. This course introduces a wide variety of non-destructive analysis techniques for use in research, design, manufacturing and industrial service. The course instructs how each technique works, how it can be applied, when and where it can be used and each technique's capabilities and limitations. The course describes how to take an industrial non-destructive analysis problem and determine which technique is best suited for the job, how to apply a given technique and which information the technique will provide. Laboratories provide hands-on experience with non-destructive analysis equipment. 3 cr. Prerequisites: undergraduate courses in physics, differential equations and statistics.

NUCL 5460G Industrial Radiography. The course describes the fundamental physics of neutron, x-ray, gamma ray and infrared radiography. Traditional and modern techniques currently in practice are discussed, along with recent advances in the technology. Applications of radiography to industrial environments are presented. Considerations for radiography system design are discussed. Topics include x-ray imaging and radiography, gamma-ray imaging and radiography, neutron imaging and radiography, infrared imaging and radiography, film based techniques, digital techniques, image processing and image enhancement, x-ray and gamma-ray sources, neutron sources and industrial applications of radiography. 3 cr.

NUCL 5470G Nuclear Forensic Analysis. There are many techniques available to forensic investigators to investigate suspect criminal activity. In addition, there are many times when forensic techniques are required to investigate nuclear-related events. This course explores nuclear and chemical techniques related to the nuclear technology and forensics. Both radiation and analytical chemistry techniques are introduced. Risks and

hazards associated with nuclear forensic investigations are reviewed and mitigation strategies developed. Data integrity and communication of results are emphasized. 3 cr.

NUCL 6000G PhD Candidacy Exam. Each student in the doctoral program is required to prepare a written research proposal and pass a candidacy exam. The thesis proposal consists of a literature review to address the current state of knowledge in the research field, thesis objectives, research hypothesis to be tested/examined, proposed methodology, timeline, major milestones and expected significance of the research outcomes. The course includes a candidacy exam that evaluates the student's research proposal, knowledge of the research field and background preparation. This non-credit course is evaluated on a pass/fail basis. 0 cr. Prerequisite: enrolment in the respective PhD program.

NUCL 6001G PhD Thesis. The dissertation is the primary component of the PhD degree requirement. The research must lead to an original contribution of knowledge in the field and must be reported fully in the candidate's dissertation. The research is carried out under the direction of the candidate's supervisor or co-supervisors in co-operation with a supervisory committee. The student receives a grade of either pass or fail. 40 cr.

NUCL 6002G Workshop and Professional Development. This course consists of a series of mandatory workshops to aid in the professional development of PhD candidates. Workshop topics may include, but are not limited to, project management, intellectual property, grantsmanship, communications and career management. The student receives a grade of either pass or fail. 0 cr.

NUCL 6003G Doctoral Seminar. This course includes participation in a program of seminars by internal and external speakers on current research topics. All PhD students are required to give seminars on their thesis research during each year that they are registered in the program. The student receives a grade of either pass or fail. 0 cr.

NUCL 6004G Directed Studies for Doctoral Candidates. Faculty permission may be given for supervised research and development projects, individual study or directed readings. Students wishing to pursue a course of directed studies must, with a faculty member who is willing to supervise such a course, formulate a proposal that accurately describes the course content, the learning goals, the intended method and extent of supervision, and the method(s) by which the student's work will be evaluated. This course may only be taken once. 3 cr.

NUCL 6005G Special Topics for Doctoral Candidates. This course covers material in an emerging area or in a subject not covered in regular offerings. This course may be taken more than once, provided the subject matter is substantially different. 3 cr.

SSCI 5001G Major Paper in Criminology. This course is designed to allow students to combine the knowledge garnered from graduate-level courses and apply them to a project resulting in a major paper. The paper will develop all of the analytical and intellectual skills of a thesis but is shorter in length. Normally, the paper should be approximately 50 pages long. The paper should be concerned with discussing a meaningful question within criminology and may require some empirical research, a critical review of the literature or a critical analysis of a theoretical problem. Students will complete this requirement under the supervision of a professor. Students receive a grade of pass or fail. 6 cr.

SSCI 5002G MA Thesis in Criminology. The MA thesis is designed to allow the student to combine the knowledge garnered from graduate-level courses and to develop it into a thesis. The potential thesis topic is to be selected and approved in consultation with the candidate's supervisor and supervisory committee. A thesis proposal must be submitted to and approved by the student's supervisory committee. Normally, the thesis will be approximately 100 pages in length. Once the thesis has been completed, students undergo an oral examination to defend their thesis. Students receive a grade of pass or fail. 12 cr.

SSCI 5010G Data Analysis 1 – Graduate (formerly Advanced Quantitative Methods - Graduate). The objective of this course is to familiarize the student with the principles of statistical analytical techniques and strategies as applied to the social sciences and humanities using the statistical software, SPSS. This course will cover descriptive and inferential statistics up to ANOVA and multiple linear regression; sampling and data modification techniques, like factor analysis and scaling, will also be discussed. 3 cr.

SSCI 5015G Data Analysis 2 – Graduate. This course is an extension of SSCI 5010G Data Analysis 1 - Graduate. The objective of this course is to familiarize students with the principles of advanced statistical analytical techniques and strategies as applied to the social sciences and humanities using the statistical software, SPSS. The analytical techniques discussed in this course will be driven by the student's data analysis for their thesis. This course will cover advanced topics like hierarchical (incremental) regression, logistic regression, ANCOVA, MANOVA and MANCOVA. 3 cr. Prerequisite: SSCI 5010G and permission of the instructor.

SSCI 5020G Criminological Theory. This seminar provides students with an in-depth overview of major criminological theories of the past and present. Students engage with psychological and sociological approaches to the study of crime. Emphasis is given to the pre-theoretical assumptions of each theory, its major contributions in criminology, key empirical findings generated by the theory and contemporary debates around each theory. In addition to reading theories in their original formulation, students are

encouraged to examine new extensions of present paradigmatic theoretical structures. 3 cr.

SSCI 5050G Professional Seminar. This is a professional development seminar with several objectives. First, the seminar is designed to provide all graduate students with an understanding of basic research issues in the areas of crime, law and justice. Second, students are introduced to the faculty members of the Faculty of Social Science and Humanities and their current research agendas. Third, students acquire knowledge and skills to aid them with completing their graduate degree and finding post-graduate employment or other university programs to continue their education. Thus, each week this course provides an in-depth discussion of current research, professional skill development and/or learning about current issues in setting goals both within the program and post completion. This course provides students with the opportunity to prepare a proposal for their major research paper/thesis under close supervision. Students share proposals with each other and provide commentary and feedback on each other's work. This course is mandatory for all students and is graded on a satisfactory/unsatisfactory evaluation scale. 3 cr.

SSCI 5060G Advanced Methods in Qualitative Research. The objective of this course is to familiarize the students with the principles of qualitative research. This course does not assume prior knowledge of qualitative methods other than a basic introduction to methods in a general undergraduate methods course. Students are exposed to a variety of qualitative methods including, but not limited to, issues of overt and covert research, comparing and contrasting qualitative and quantitative methods, content analysis, participant observation and historical comparative methods. Students also learn how to use these methods with quantitative methods. 3 cr.

SSCI 5100G Graduate Seminar on Contemporary Issues in Criminology. The main objective of this course is to provide an in-depth, critical overview of several new directions and debates in contemporary criminological theory and research. Students are required to engage in a critical analysis of relevant public discourse, research and scholarly literature, and appropriate theoretical and conceptual foundations on selected issues in relation to the nature, extent of and response to crime in modern societies. The course requires students to apply what they have learned to controversial moral, social, economic, political and/or legal issues and their relationship to crime. Topics covered depend on the expertise and interests of the instructor and may include, but are not limited to, critical versus traditional perspectives, economic and white-collar crime, state crime, the ethics of criminological research, environmental design and crime, criminalization and punishment, environmental pollution, cybercrime, media made criminality, organized crime, terrorism, drugs, the criminalization and victimization of women, and other timely and relevant issues emerging from current literature and conference debates. 3 cr.

SSCI 5200G Graduate Seminar in Inequality and Crime. The main objective of this course is to provide an in-depth, critical overview of several new directions in criminological theory and research in the areas of inequality and crime. Students explore the interplay of race/ethnicity, social class and gender in relation to crime and its control and are challenged to critically evaluate some of the major explanations offered for these relationships. Special attention is devoted to left realist and feminist contributions to a sociological understanding of North American inner-city crime and to sociological work on the relationship between masculinities and crime in various social settings. 3 cr.

SSCI 5300G Cybercrime and Criminology. This course explores how a networked world has bred new crimes and new responses and investigates how the computer has become a tool, a target, a place of criminal activity and national security threats, and a mechanism of response. It reviews the origins of these crimes in ordinary crime and traces how these crimes have developed. It examines responses to the emerging threats posed by the various forms of cybercrime and considers the effectiveness of strategies used to combat them. Special topics may include: some in-depth study of predatory stalking, child pornography, hacking, fraud against individuals or companies, and cyber-terrorism. Since these crimes and their prosecution are often transnational, a comparative approach is taken. The course discusses whether national laws are sufficient to regulate international activities and examines international responses to the problem of cybercrime. 3 cr.

SSCI 5400G Special Topics in Criminology. The purpose of these special topics courses is to allow students to delve deeper into more substantive areas in which they are interested. The content of each course varies with instructor interests and current research specializations and projects. Special topics courses may be offered either inside the Faculty of Social Science and Humanities or may be taken outside with the approval of the graduate committee. These graduate courses explore a selection of research topics in criminology via thorough and critical reviews of current literature. Courses are expected to offer highly specialized substantive knowledge on topics in criminology. 3 cr.

SSCI 5500G Reading Course. Students are required to do a series of readings in a particular area of criminology and write an advanced-level literature review. Students are required to summarize relevant literature on a topic around a clearly stated research question of some significance. They are required to provide a critical appraisal of the strengths, limitations, gaps in knowledge, inconsistencies and conflicting viewpoints associated with the literature and to write their own interpretation of the contribution and implications of the literature to the research question at hand. 3 cr.

UN 0500 Engineering Project, UOIT (formerly Industrial Research Project, UOIT). If they so elect, candidates for the MEng (Nuclear Engineering) degree may do an engineering project in an industrial laboratory. This consists of an industry-oriented project under the co-supervision of a suitably qualified staff scientist and a university supervisor. The engineering project counts as two non-core UNENE courses, and requires the same amount of work and time as taking two UNENE courses. UNENE will attempt to facilitate an engineering project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by UNENE. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The engineering project can only be undertaken after at least half the required UNENE MEng courses have been taken.

UN 0501 Fuel Management. Nuclear fuel cycles are studied from mining to ultimate disposal of the spent fuel, including the enrichment processes and the reprocessing techniques, from a point of view of the decision making processes and the evaluation of the operational and economical consequences of these decisions. For the steps within the fuel cycles, the method of determining the associated costs, in particular those relevant to the disposal of nuclear waste, and the overall fuel cycle costs are described. Burn-up calculations are performed for the swelling time of the fuel within the reactor core. The objectives and merits of in-core and out-of-core fuel management for CANDU Pressurized Heavy Water Reactors (PHWR) and Light Water Reactors (LWR) are analyzed in detail for the refueling equilibrium as well as for the approach to refueling equilibrium. The course also covers fuel management for thorium-fuelled CANDU reactors and other advanced fuels such as MOX containing plutonium from discarded nuclear warheads and DUPIC (Direct Use of PWR fuel in CANDU reactors). The fuel management problem is treated as an optimization problem with objective functions or performance indexes identified as well as decision variables and appropriate constraints (active and non-active). The course also includes a review of the major work done in this area along with the most important computer codes.

UN 0502 Nuclear Power Plant Systems and Operations (formerly UN 0801). System and overall unit operations relevant to nuclear power plants; includes all major reactor and process systems; nuclear plant simulator; self-study using interactive CD-ROM. Two to three class one day meetings will be scheduled.

UN 0600 Engineering Project, Western University (formerly Industrial Research Project, University of Western Ontario). If they so elect, candidates for the MEng (Nuclear Engineering) degree may do an engineering project in an industrial laboratory. This consists of an industry-oriented project under the co-supervision of a suitably qualified staff scientist and a university supervisor. The engineering project counts as

two non-core UNENE courses, and requires the same amount of work and time as taking two UNENE courses. UNENE will attempt to facilitate an engineering project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by UNENE. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The engineering project can only be undertaken after at least half the required UNENE MEng courses have been taken.

UN 0601 Control, Instrumentation and Electrical Systems in CANDU based Nuclear Power Plants. This course covers the basic control, instrumentation and electrical systems commonly found in CANDU based nuclear power plants. The course starts with an overall view of the dynamics associated with different parts of the plant, i.e., reactor, heat transport systems, moderator, steam generator, turbine and electrical generator. Based on such knowledge, the control and regulation functions in the above systems are then defined. Different instrumentation and measurement techniques are examined, along with control strategies. The time and frequency domain performance characterizations of control loops are introduced with consideration of actuator and sensor limitations. Different controller design and tuning methods and instrumentation calibration procedures are discussed. Two modes of operation of CANDU plants will be analyzed, i.e., normal mode and alternate mode. Advanced control technologies, such as distributed control systems, and Field bus communication protocols are introduced in view of their potential applications in the existing and newly constructed CANDU power plants. The electric systems in the CANDU plant will be examined. The modeling of the dynamics and control devices for the generator will be covered in detail. The dynamic interaction between the CANDU power plants and the rest of the electric power grid with other generating facilities and various types of load will be studied.

UN 0602 Nuclear Fuel Waste Management. Presently, nuclear fuel waste management involves storage in water pools or dry storage containers at reactor sites. If the fuel is then defined as waste, permanent disposal at an appropriate deep geological site would be considered. This course will describe the physical and chemical properties of the fuel and these approaches to storage and disposal. Key features of the fuel include its chemical and physical structure and properties prior to, and after, in-reactor irradiation, the nature and distribution of radionuclides produced in-reactor, and the chemical and physical properties of the Zircaloy fuel cladding before and after in-reactor exposure. The principles behind pool and dry storage will be described including the design of storage containers and the chemical and corrosion processes that could influence their long-term integrity. The possible permanent disposal scenarios developed internationally will be discussed, with a primary emphasis on those potentially applicable in Canada. For this last topic, the design and fabrication of waste

containers and the processes that could potentially lead to their failure, the properties of engineered barriers within the geological site, the essential geological features of the chosen site and the computational modeling approaches used in site performance assessment calculations will be described.

UN 0603 Project Management for Nuclear Engineers. Project management is emerging as perhaps the key core competency in engineering in the 21st century industrial workplace. This course in project management will prepare nuclear engineers in the application of this discipline in their work. It is an intensive investigation into the major principles of project management slanted towards, but not exclusively about, the management of nuclear engineering projects. The course uses the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) as a skeleton and expands that coverage with relevant examples from nuclear, software and general engineering. Special emphasis will be placed on risk management, particularly in the area of safety-critical projects. The graduate will be well positioned both to apply the knowledge in their area of engineering and to sit the PMI's Project Management Professional (PMP) examination. The course will be taught by a professional engineer holding the PMP certification, using many case studies from industry and engineering.

UN 0700 Engineering Project, University of Waterloo (formerly Industrial Research Project, University of Waterloo). If they so elect, candidates for the MEng (Nuclear Engineering) degree may do an engineering project in an industrial laboratory. This consists of an industry-oriented project under the co-supervision of a suitably qualified staff scientist and a university supervisor. The engineering project counts as two non-core UNENE courses, and requires the same amount of work and time as taking two UNENE courses. UNENE will attempt to facilitate an engineering project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by UNENE. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The engineering project can only be undertaken after at least half the required UNENE MEng courses have been taken.

UN 0701 Engineering Risk and Reliability. This course presents a broad treatment of the subject of engineering decision, risk and reliability. Emphasis is on (1) the modeling of engineering problems and evaluation of systems performance under conditions of uncertainty; (2) risk-based approach to life-cycle management of engineering systems; (3) systematic development of design criteria, explicitly taking into account the significance of uncertainty; and (4) logical framework for risk assessment and risk benefit trade-offs in decision making. The necessary mathematical concepts are developed in the context of engineering problems. The main topics of discussion are probability theory, statistical data analysis, component and system reliability concepts,

time-dependent reliability analysis, computational methods, life-cycle optimization models and risk management in public policy.

UN 0800 Engineering Project, McMaster University (formerly Industrial Research Project, McMaster University). If they so elect, candidates for the MEng (Nuclear Engineering) degree may do an engineering project in an industrial laboratory. This consists of an industry-oriented project under the co-supervision of a suitably qualified staff scientist and a university supervisor. The engineering project counts as two non-core UNENE courses, and requires the same amount of work and time as taking two UNENE courses. UNENE will attempt to facilitate an engineering project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved by UNENE. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The engineering project can only be undertaken after at least half the required UNENE MEng courses have been taken.

UN 0802 Nuclear Reactor Physics (formerly Nuclear Reactor Analysis). Introduction to nuclear energy; nuclear physics and chain reactions, reactor statics and kinetics; multi group analysis, core thermalhydraulics; reactor design.

UN 0803 Nuclear Reactor Safety Design. Safety design and analysis of nuclear reactors based on deterministic and probabilistic assessments. Topics include: concepts of risk; probability tools and techniques; safety criteria; design basis accidents; risk assessment; safety analysis; safety system design; and general policy and principles.

UN 0804 Nuclear Reactor Heat Transport System Design. This course covers the fundamentals of nuclear reactor heat transport system design for key reactor types, with emphasis on the CANDU and Light Water Reactor (PWR and BWR) designs. Theoretical tools and their application include reactor thermodynamics, single-phase and two phase flow, heat and mass transfer, critical heat flux, pressure drop prediction, flow stability, design of reactor core, reactor vessel, steam generators and primary heat transport pumps. The course also covers experimental techniques, facilities and results. Course assignments are analytical problems related to these topics.

UN 0805 Introduction to Operational Health Physics. An introduction to a number of topics that will be encountered in the practice of health physics. The following topics will be discussed: dose limitation; dosimetric quantities for individuals and populations; ioinzing radiation risks and hazards; ICRP-60; internal doses and the compartment model; derived air concentrations and annual limit on intake; metabolic models for respiratory system and GI tract, radiation safety at nuclear reactors, particle accelerators, irradiators, X-Ray installations and laboratories; pathway analysis; derived

release limits; environmental monitoring, sample collection and preparation, and sources of radiation; atmospheric transport; cost-benefit analysis; and derivation of limits for surface contamination.

UN 0806 Nuclear Fuel Engineering. This non-core UNENE course covers power reactor fuel design, performance and safety aspects, and complements other UNENE courses on reactor core design, thermohydraulics and reactor safety design. It includes fissile and fertile fuels; burn-up effects; fuel production (as well as uranium enrichment and reprocessing of spent fuel), quality assurance and CANDU fuel technical specifications; thermal conductivity; fuel chemistry; fuel restructuring and grain growth; fission product behaviour; fuel defect detection and location; fuel performance in operation; and fuel/fuel channel behaviour in design basis and severe accidents.

UN 0807 Power Plant Thermodynamics (formerly UN 0702). Theoretical and practical analysis of the following with particular reference to CANDU plants. Thermodynamic Cycles: nuclear versus conventional steam cycles, regenerative feedwater heating, moisture separation and reheating, tubine expansion lines, heat balance diagrams, available energy, cycle efficiency and exergy analysis. Nuclear Heat Removal: heat conduction and convection in fuel rods and heat exchanger tubes, heat transfer in boilers and condensers, boiler influence on heat transport system, boiler swelling and shrinking, boiler level control and condenser performance. Steam Turbine Operation: turbine configuration, impulse and reaction blading, blade velocity diagrams, turbine seals and sealing systems, moisture in turbines, part load operation, back pressure effects, thermal effects and turbine governing.

UN 0808 Reactor Chemistry and Corrosion (formerly UN 1001). Corrosion and its costs, corrosion measurement, general materials and environment affects. Types of corrosion: uniform, galvanic, crevice, pitting, intergranular, selective leaching, erosion corrosion, stress-corrosion, hydrogen effects. Corrosion testing: materials selection. Electrochemical principles: thermodynamics, electrode kinetics, mixed potentials, practical applications. High temperature corrosion. Nuclear plant corrosion, fossil plant corrosion, other industrial environments.

UN 0900 Engineering Project, Queen's University (formerly Industrial Research Project, Queen's University). If they so elect, candidates for the MEng (Nuclear Engineering) degree may do an engineering project in an industrial laboratory. This consists of an industry-oriented project under the co-supervision of a suitably qualified staff scientist and a university supervisor. The engineering project counts as two non-core UNENE courses, and requires the same amount of work and time as taking two UNENE courses. UNENE will attempt to facilitate an engineering project in consultation with the candidate and through negotiation with the candidate's employer. A satisfactory project topic and appropriate arrangements are required for the project to be approved

by UNENE. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the university. The engineering project can only be undertaken after at least half the required UNENE MEng courses have been taken.

UN 0901 Nuclear Materials. A nuclear reactor presents a unique environment in which materials must perform. In addition to the high temperatures and stresses to which materials are subjected in conventional applications, nuclear materials are subjected to various kinds of radiation which affect their performance, and often this dictates a requirement for a unique property (for example, a low cross section for thermal neutron absorption) that is not relevant in conventional applications. The effects of the radiation may be direct (e.g., the displacement of atoms from their normal positions by fast neutrons or fission fragments), or indirect (e.g., a more aggressive chemical environment caused by radiolytic decomposition). This course describes materials typically used in nuclear environments, the unique conditions to which they are subjected, the basic physical phenomena that affect their performance and the resulting design criteria for reactor components made from these materials.

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