UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

Report No. 3627 Revised

MEMORANDUM

To: Executive Committee of Faculty Council (March 28, 2019)
Faculty Council (April 11, 2019)

From: Professor Julie Audet
Chair, Engineering Graduate Education Committee (EGEC)

Date: April 4, 2019

Re: **Adding Direct Entry and Flex-Time Admission Options to MSE PhD**

REPORT CLASSIFICATION

This is a major policy matter that will be considered by the Executive Committee for endorsing and forwarding to Faculty Council for vote as a regular motion (requiring a simple majority of members present and voting to carry).

SUMMARY

The Department of Materials Science & Engineering proposes to add a Direct Entry option to its existing doctoral program, allowing students without the equivalent of an MASc degree to apply for and be accepted into the PhD program.

The department also proposes to add a Flex-Time option to its doctoral program, allowing practicing professionals in a relevant field of study who require a modified time period and/or content delivery option to complete the requirements of the PhD program.

MOTION

Per the attached major modification proposal, the Executive Committee recommends to Faculty Council the following motion –

> THAT the Direct Entry and Flex-Time options to the PhD in the Department of Materials Science & Engineering be established, effective September 1, 2019.

APPENDIX 1 to REPORT 3627

University of Toronto

Major Modification Proposal: Significant Modifications to Existing Graduate and Undergraduate Programs

This template should be used to bring forward all proposals for major modifications to existing graduate and undergraduate programs for governance approval under the University of Toronto's Quality Assurance Process.

Program being modified:	Doctor of Philosophy (PhD)
Proposed major modification:	Adding Direct Entry option to existing PhD program Adding Flex-Time option to existing PhD program
Department/unit:	Materials Science & Engineering (MSE)
Faculty/academic division:	Applied Science & Engineering (FASE)
Dean's office contact:	Professor Julie Audet, Vice-Dean, Graduate Studies
Proponent:	Professor Uwe Erb, Associate Chair, Graduate Studies (MSE)
Version date:	April 4, 2019

Summary

The proposed change is the addition of a Direct Entry option to the existing doctoral (PhD) program in the Department of Materials Science & Engineering (MSE), allowing students without the equivalent of a Master of Applied Science (MASc) degree to apply for and be accepted into the PhD program.

It is also proposed to add a Flex-Time option to MSE's PhD program, allowing practising professionals in a relevant field of study who require a modified time period and/or content delivery option to complete the requirements of the PhD program.

Effective Date

These options will be effective September 1, 2019.

Academic Rationale

Direct Entry Option

Currently, when students with undergraduate qualifications apply for MSE graduate programs the only options available are the Master of Applied Science (MASc, thesis-based) and Master of Engineering (MEng, course-based) programs. However, at times

MSE receives applications from students with exceptionally strong undergraduate qualifications and relevant research experience which would make them better suited for immediate entry to the PhD program. The purpose of this modification is to attract and provide a Direct Entry pathway for these high-quality students, and to better align MSE with other FASE departments who already offer the Direct Entry option to similarly qualified students, such as Chemical Engineering & Applied Chemistry, and Mechanical & Industrial Engineering.

It is anticipated that the addition of the Direct Entry option will increase the enrolment of PhD students in MSE by three to six students per year.

Flex-time Option

At times, MSE receives applications from active professional engineers engaged in work activities that may include permanent or contractual work, self-employment, consulting or equivalent, with appropriate qualifications and relevant experience who would benefit from acquiring a PhD and who would, in turn, contribute signifcantly to research in MSE. Introducing the Flex-Time option would attract these professionals and allow them to undertake MSE's PhD program while continuing to work.

It is anticipated that the addition of the Flex-Time option would increase the enrolment of PhD students in MSE by one to two students per year.

Description of the Proposed Major Modifications

MSE already has a Transfer option, whereby very strong MASc students may apply to transfer to the PhD program after completing one year of the MASc program.

Direct Entry Option

The proposed addition of a Direct Entry option pertains to MSE program enrolment. Exceptionally strong BASc students with an average of A- over the final four terms of undergraduate studies may be considered for Direct Entry to the PhD program. A student who is admitted through this option must complete the PhD Graduate Research Seminar (0.5 FCE) plus 2.5 FCE courses, for a total of 3.0 FCEs. Students must also complete the thesis seminar JDE 1000H Ethics in Research, a non-credit course.

Flex-Time Option

The proposed addition of a Flex-Time option will allow MSE to admit a few highly-qualified and highly-motivated PhD students who are also employed full-time as practicing engineers. The SGS guidelines for the flex-time PhD option require that applicants demonstrate (i) that the research and proposed program of study are related to the applicant's professional work, and (ii) that they will continue their professional activities while registered in the program. Those registered as Flex-Time must complete 2.0 full-course equivalents (FCEs) as follows:

Year 1: 1.0 FCE and the non-credit seminar JDE1000 Ethics in Research
Year 2: 0.5 FCE. Prepare a research proposal and pass the Qualifying Exam
Year 3: Present the first seminar for MSE2000 (0.5 FCE)
Year 4: Research and writing
Year 5: Research and writing. Present the second seminar for MSE2000
Year 6: Defend the thesis at the Final Oral Examination by August 30

Students in the Flex-Time option are registered full-time during the first four years and part-time during subsequent years in the program.

The admission and program requirements for the Transfer from MASc, the Direct Entry, and the Flex-Time options are described in the Proposed Calendar Copy, Appendix B.

Impact of the Change on Students

Direct Entry Option

This program modification will not have an impact on existing students. A very small, select number of future students are expected to enter the MSE PhD program though the Direct Entry option. This could possibly result in some students with a lower level of preparedness for the academic independence and rigor required for the PhD, but because the students admitted through this option will be individually selected by MSE, and not self-identified, it is expected that this potential problem will be mitigated.

As well, the admission grade requirement for the Direct Entry option, an A- in the final four terms of undergraduate studies, is higher than the standard grade requirement of B+ in the qualifying MASc degree. Finally, the MSE course-load requirement will be increased from the MSE standard PhD requirement of 2.0 FCEs, to 3.0 FCEs.

Flex-time Option

This program modification will not have an impact on existing students. A very small, select number of future students are expected to register as flex-time in the MSE PhD program.

Consultation

These program modifications will not have any impact on other units. MSE faculty, other engineering departments, the Faculty's Engineering Graduate Education Committee and the Vice-Provost, Academic Programs, were consulted during the development of this proposal.

Resources

No additional resources will be required.

UTQAP Process

The UTQAP pathway is summarized in the following table.

Steps	**Dates**
Development/consultation within unit	September 2018
Approval within unit	September 2018
Consultation with offices of FASE Dean and Vice-Provost, Academic Programs	March 2019
Approval of FASE Engineering Graduate Education Committee on behalf of Faculty	March 2019
Approval of FASE Council	April 2019
Submission to Provost's office	April 2019
Reported to the Provost and included in annual report to AP&P	Per Governing Council calendar
Reported to Ontario Quality Council	July 2019

Appendix A: Proposed Learning Outcomes and Degree-Level Expectations

The design, structure, requirements and delivery of the Direct Entry and Flex-Time options support the PhD program learning outcomes and degree-level expectations as highlighted in yellow below.

Doctoral (PhD) Degree-Level Expectations	Program Learning Outcomes	How the Program Design/Structure Supports the Degree-Level Expectations
EXPECTATIONS: This PhD is awarded to students who have demonstrated:		
1. Depth and Breadth of Knowledge A thorough understanding of a substantial body of engineering or applied science knowledge that is at the forefront of their discipline including, where appropriate, relevant knowledge outside the field.	Depth and breadth of knowledge are understood in the doctoral (PhD) in the Materials Science and Engineering program as the ability to undertake a major research thesis in a field related to materials engineering, and as fluency in subjects related to this field. This is reflected in students who are able to apply research, analysis and design skills within the field of materials engineering to develop and implement leading-edge technologies in industry and academia.	The program design and requirement elements that ensure these outcomes for depth of knowledge are the production of a thesis consisting primarily of significant original research, supplemented by courses that are chosen in consultation with their advisor. Elements that ensure these student outcomes for breadth of knowledge are the completion of course work that covers the academic field of the student more broadly, and attendance at research seminars to supplement the coursework. Some courses may be taken from outside MSE, further addressing the breadth requirement. The PhD program requires 2.0 FCEs. The Direct Entry PhD program requires 3.0 FCEs. The Flex-Time option requires 2.0 FCEs.
2. Research and Scholarship The ability to: (a) Conceptualize, design, and implement research for the generation of new knowledge, applications, or understanding	Research and scholarship is understood in the doctoral (PhD) program as demonstration of an understanding and ability to implement established techniques of research and inquiry to create and interpret knowledge related	By way of their research, students learn to imagine, design and implement a research plan to generate new knowledge or understanding; they become a specialist in their field; and they articulate their work in the form of

Doctoral (PhD) Degree-Level Expectations	Program Learning Outcomes	How the Program Design/Structure Supports the Degree-Level Expectations
at the forefront of the discipline, and to adjust the research design or methodology in the light of unforeseen problems; (b) Make informed judgments on complex issues in specialist fields, sometimes requiring new methods; and (c) Produce original research, or other advanced scholarship, of a quality to satisfy peer review, and to merit publication.	to materials engineering, to evaluate critically current research and scholarship in materials engineering. On the basis of that competence and through their dissertation, PhD students further demonstrate the development and support of a sustained argument in written form, and originality in the application of scientific knowledge. This is reflected in students who are able to: 1. Articulate a clear hypothesis or overall goal for their PhD research project (for example, solve a specific problem, develop a new technology, challenge a current paradigm or practice, address a critical bottleneck in the field). 2. Plan and design critical experiments or simulations to prove or disprove hypotheses or to achieve the overall goal stated in the PhD proposal. 3. Interpret analytical, numerical and experimental data and outcomes and appreciate the limitations of the approaches used. 4. Acquire in depth knowledge of the relevant literature and understand scientific and engineering concepts relevant to their PhD.	a written thesis and other publications that must pass the scrutiny of peer review.
3. Level of Application of Knowledge The capacity to: (a) Undertake pure and/or applied research at an	Level of application of knowledge is understood in the doctoral (PhD) in the Materials Science and Engineering program as	By way of coursework, students continue to build competence in the application of knowledge to solve advanced problems, beyond the level achieved at the undergraduate and master's levels.

Doctoral (PhD) Degree-Level Expectations	Program Learning Outcomes	How the Program Design/Structure Supports the Degree-Level Expectations
advanced level; and (b) Contribute to the development of academic or professional skills, techniques, tools, practices, ideas, theories, approaches, and/or materials.	competence in and understanding of the field of materials engineering beyond that of the undergraduate level, attained through coursework, plus competence in research, attained by creating knowledge or capabilities through the production of a thesis. This is reflected in students who are able to plan and execute an original and conclusive scientific investigation that develops into a full PhD thesis and results in publication of peer-reviewed papers.	They further develop such skills by focusing extended attention on one problem. The PhD program requires 2.0 FCEs. The Direct Entry PhD program requires 3.0 FCEs. The Flex-Time option requires 2.0 FCEs.
4. Professional Capacity/Autonomy (a) The qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and largely autonomous initiative in complex situations; (b) The intellectual independence to be academically and professionally engaged and current; (c) The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and (d) The ability to evaluate the broader implications of applying knowledge to particular contexts.	Professional capacity/autonomy is understood in the doctoral (PhD) program in Materials Science and Engineering as personal responsibility, integrity, independent decision-making and accountability related to the academic process of doctoral research. This is reflected in students who are able to conduct research and complete a PhD thesis.	The program design and requirement elements that ensure these student outcomes for professional capacity/autonomy are contained within the coursework, where students must demonstrate their capacity for independent, responsible work, and within the thesis requirements, where students must exhibit integrity and responsibility in research and the reporting of research results.
5. Level of Communications Skills	Level of communications skills is understood in the doctoral (PhD)	The program design and requirement elements that ensure

Doctoral (PhD) Degree-Level Expectations	Program Learning Outcomes	How the Program Design/Structure Supports the Degree-Level Expectations
The ability to communicate complex and/or ambiguous ideas, issues and conclusions clearly and effectively.	program as the ability to communicate, both verbally and in written form, results of research and the methodologies employed to produce the results. This is reflected in students who are able to write a full PhD thesis, academic papers, and to present research in an oral format.	these student outcomes are the expectation that all graduate students practice and learn communication skills via their coursework, in the form of presentations, preparing assignments and projects, often collaboratively with other students. Students must also write a thesis, give two departmental seminars, and defend it orally. They are also offered the opportunity to regularly present their work at workshops and conferences, and to publish their work in the form of conference and journal papers.
6. Awareness of Limits of Knowledge (a) An appreciation of the limitations of one's own work and discipline, of the complexity of knowledge, and of the potential contributions of other interpretations, methods, and disciplines.	Awareness of limits of knowledge is understood in the doctoral (PhD) program in Materials Science and Engineering as a cognizance of the complexity and multidisciplinarity of the knowledge associated with materials engineering and its application. This is reflected in students who are able to design and implement research projects that prove or disprove a hypothesis, and interpret results with an appreciation for the limits of the methods used.	The program design and requirement elements that ensure these student outcomes for awareness of limits of knowledge is coursework that exposes students to the limits of knowledge. They further develop that awareness by reviewing the literature related to their own work, as they develop expertise in their specific field.

Appendix B: Proposed 2019-20 SGS Calendar

Changes are highlighted in red text.

Materials Science and Engineering

MSE: Materials Science and Engineering PhD

Doctor of Philosophy

Program Description

Pursuing a PhD degree, the most advanced research degree in the Faculty of Applied Science and Engineering, can be a stepping stone to an academic career or to an industrial career which would benefit from in-depth applied research and research skills. Under the guidance of an accomplished supervisor, PhD students engage in original research that contributes to a variety of fields of study. Four years of PhD study allowing students to collaborate with local and international colleagues culminates in a written thesis which is presented orally and evaluated by experts. This is a degree program for outstanding students.

Applicants may enter the PhD program via one of ~~two~~ three routes: 1) following successful completion of an MASc degree; 2) transfer from the University of Toronto MASc program to continue work that was begun at that level; or 3) direct entry following completion of an appropriate bachelor's degree. The program can also be taken on a flexible-time basis.

PhD Program

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Materials Science and Engineering (MSE)'s additional admission requirements stated below.
- Students must have completed a master's-level program before entering the PhD program.
- ~~Very strong **MASc students may apply to transfer** to the PhD program after~~

~~completing one year of the MASc program. Regulations governing such transfers are available in the MSE Graduate Studies office. A student who is permitted such a transfer must complete the PhD Graduate Research Seminar, plus one more graduate-level course (0.5 full-course equivalent [FCE]), in addition to the four courses (2.0 FCEs) already completed in the MASc program.~~

- For students whose primary language is not English, the department requires a Test of English as a Foreign Language (TOEFL) with the following minimum scores:

paper-based TOEFL: minimum score of 580 and 4 on the Test of Written English (TWE)

Internet-based TOEFL: minimum score of 93/120 and 22/30 on the writing and speaking sections.

Program Requirements

- The primary subject in a program will be extractive and process metallurgy, physical metallurgy, or materials science.
- **Coursework.** The program of study normally includes **2.0 FCEs** (four half courses), including the weekly ~~PhD~~ Graduate Research Seminar, and a thesis. T~~Normally, t~~he coursework selected normally includes:

~~The PhD~~MSE 2000H^{0} *Graduate Research Seminar PhD* (0.5 FCE)~~, which is a half-year course.~~

Three half courses (1.5 FCEs), at least one of which must be chosen from the list of MSE graduate course offerings.

The departmental seminar, compris~~es~~ing a minimum of two seminars presented to the academic staff and students of MSE.

- A general **Qualifying Examination** must be scheduled and taken within 12 months of initial registration. In case of failure, one further attempt within

three months is allowed, no later than within 15 months of initial registration. No further attempts are permitted. In order to take this examination, students must complete all required coursework except for the Graduate Research Seminar. The Qualifying Examination consists of:

A report (25 to 30 pages) of research to date, in the form of a dossier.

A presentation (20 to 25 minutes) summarizing research, with particular emphasis on providing a critical assessment of the literature in the field, a central hypothesis of thesis, proposed methodology, and recent experimental progress.

An oral examination, immediately following the presentation, by the Qualifying Examination committee who will ask the candidate questions pertaining to either the presented material, or related questions in materials science. The student is expected to have a working-level knowledge of the fundamentals of materials science as it pertains to the proposed area of research, and on a broader basis, at the level of a second-year undergraduate student in Materials Science.

- ~~All required coursework, Graduate Seminar excepted, must be completed in order to take this examination.~~
- ~~**Note:** students wishing to bypass (transfer) to PhD, no later than 12 months after initial registration in MASc, must also fulfil these Qualifying Examination requirements.~~
- The required **thesis** is based upon research work carried out in the department in the areas of extractive and process metallurgy, physical metallurgy, or materials science.
- Students have the option of completing an emphasis in Sustainable Energy as part of their degree program. Please see details in the Materials Science and Engineering MASc, MEng, PhD Emphases section.

Program Length

4 years full-time~~; 5 years transfer from master's~~

Time Limit

6 years full-time~~; 7 years transfer from master's~~

[0] Course that may continue over a program. The course is graded when completed.

PhD Program (Transfer)

Transfer Requirements

- Very strong MASc students may apply to transfer to the PhD program after completing one year of the MASc program. Regulations governing such transfers are available in the MSE Graduate Studies office.

Program Requirements

- The primary subject in a program will be extractive and process metallurgy, physical metallurgy, or materials science.
- **Coursework.** The program of study normally includes **2.5 full-course equivalents (FCEs)**, including the weekly Graduate Research Seminar, and a thesis. The coursework selected normally includes:

Three courses (1.5 FCEs) from the MASc program.

MSE 2000H[0] *Graduate Research Seminar PhD* (0.5 FCE).

An additional 0.5 graduate FCE.

- A general **Qualifying Examination** must be scheduled and taken within 12 months of initial registration. In case of failure, one further attempt within three months is allowed, no later than within 15 months of initial registration. No further attempts are permitted. In order to take this examination, students must complete all required coursework except for the Graduate Research Seminar. The Qualifying Examination consists of:

A report (25 to 30 pages) of research to date, in the form of a dossier.

A presentation (20 to 25 minutes) summarizing research, with particular emphasis on providing a critical assessment of the literature in the field, a central hypothesis of thesis, proposed methodology, and recent experimental progress.

An oral examination, immediately following the presentation, by the Qualifying Examination committee who will ask the candidate questions pertaining to either the presented material, or related questions in materials science. The student is expected to have a working-level knowledge of the fundamentals of materials science as it pertains to the proposed area of research, and on a broader basis, at the level of a second-year undergraduate student in Materials Science.

- The required **thesis** is based upon research work carried out in the department in the areas of extractive and process metallurgy, physical metallurgy, or materials science.
- Students have the option of completing an emphasis in Sustainable Energy as part of their degree program. Please see details in the Materials Science and Engineering MASc, MEng, PhD Emphases section.

Program Length
5 years full-time

Time Limit
7 years full-time

[0] *Course that may continue over a program. The course is graded when completed.*

PhD Program (Direct-Entry)

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Materials Science and Engineering (MSE)'s additional admission requirements stated below.
- Exceptionally strong BASc students with an average grade of A– over the final four terms of undergraduate studies (excluding Summer terms in some cases) may be considered for direct entry to the PhD program.

- For students whose primary language is not English, the department requires a Test of English as a Foreign Language (TOEFL) with the following minimum scores:

paper-based TOEFL: minimum score of 580 and 4 on the Test of Written English (TWE)

Internet-based TOEFL: minimum score of 93/120 and 22/30 on the writing and speaking sections.

Program Requirements

- The primary subject in a program will be extractive and process metallurgy, physical metallurgy, or materials science.
- **Coursework.** The program of study normally includes **3.0 full-course equivalents (FCEs)**, including the weekly Graduate Research Seminar, and a thesis. The coursework selected normally includes:

MSE 2000H^0 *Graduate Research Seminar PhD* (0.5 FCE).

Five half courses (2.5 FCEs), at least two of which must be chosen from the list of MSE graduate course offerings.

- Students must complete the thesis seminar JDE 1000H *Ethics in Research*, a non-credit course.
- A general **Qualifying Examination** must be scheduled and taken within 12 months of initial registration. In case of failure, one further attempt within three months is allowed, no later than within 15 months of initial registration. No further attempts are permitted. In order to take this examination, students must complete all required coursework except for the Graduate Research Seminar. The Qualifying Examination consists of:

A report (25 to 30 pages) of research to date, in the form of a dossier.

A presentation (20 to 25 minutes) summarizing research, with particular emphasis on providing a critical assessment of the literature in the field, a central hypothesis of thesis, proposed methodology, and recent experimental progress.

An oral examination, immediately following the presentation, by the Qualifying Examination committee who will ask the candidate questions pertaining to either the presented material, or related questions in materials science. The student is expected to have a working-level knowledge of the fundamentals of materials science as it pertains to the proposed area of research, and on a broader basis, at the level of a second-year undergraduate student in Materials Science.

- The required **thesis** is based upon research work carried out in the department in the areas of extractive and process metallurgy, physical metallurgy, or materials science.
- Students have the option of completing an emphasis in Sustainable Energy as part of their degree program. Please see details in the Materials Science and Engineering MASc, MEng, PhD Emphases section.

Program Length
5 years full-time

Time Limit
7 years full-time

[0] *Course that may continue over a program. The course is graded when completed.*

PhD Program (Flexible-Time)

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the Department of Materials Science and Engineering (MSE)'s additional admission requirements stated below.
- Students must have completed a master's-level program before entering the PhD program.

- For students whose primary language is not English, the department requires a Test of English as a Foreign Language (TOEFL) with the following minimum scores:
    - paper-based TOEFL: minimum score of 580 and 4 on the Test of Written English (TWE)
    - Internet-based TOEFL: minimum score of 93/120 and 22/30 on the writing and speaking sections.
- Applicants to the flexible-time PhD option are accepted under the same admission requirements as applicants to the full-time PhD option.

Program Requirements

- Students must complete **2.0 full-course equivalents (FCEs)** as follows:
    - Year 1: 1.0 FCEs and the non-credit seminar JDE 1000H *Ethics in Research.*
    - Year 2: 0.5 FCE. Prepare a research proposal and pass the Qualifying Examination.
    - Year 3: Present the first seminar for MSE 2000H^0, 0.5 FCE.
    - Year 4: Research and writing.
    - Year 5: Research and writing. Present the second seminar for MSE 2000H^0.
    - Year 6: Defend the thesis at the Doctoral Final Oral Examination by August 30.
- Students in the Flex-Time option are registered full-time during the first four years and part-time during subsequent years in the program.
- The general Qualifying Examination must be scheduled and taken within 12 months of initial registration. In case of failure, one further attempt within three months is allowed, no later than within 15 months of initial registration. No further attempts are permitted. In order to take this examination, students must complete all required coursework except for the Graduate Research

Seminar. The Qualifying Examination consists of:

A report (25 to 30 pages) of research to date, in the form of a dossier.

A presentation (20 to 25 minutes) summarizing research, with particular emphasis on providing a critical assessment of the literature in the field, a central hypothesis of thesis, proposed methodology, and recent experimental progress.

An oral examination, immediately following the presentation, by the Qualifying Examination committee who will ask the candidate questions pertaining to either the presented material, or related questions in materials science. The student is expected to have a working-level knowledge of the fundamentals of materials science as it pertains to the proposed area of research, and on a broader basis, at the level of a second-year undergraduate student in Materials Science.

- The required **thesis** is based upon research work carried out in the department in the areas of extractive and process metallurgy, physical metallurgy, or materials science.
- Students have the option of completing an emphasis in Sustainable Energy as part of their degree program. Please see details in the Materials Science and Engineering MASc, MEng, PhD Emphases section.

Program Length
6 years

Time Limit
8 years

[0] *Course that may continue over a program. The course is graded when completed.*

MSE: Materials Science and Engineering MASc, MEng, PhD Courses

A schedule is available on the MSE website at the beginning of the Fall session, listing the time and room location for each course offered in MSE in both the Fall and Winter sessions.

Not all courses are offered every year. Please consult the department for a listing of courses being offered this year.

All students wishing to undertake graduate research in the Department of Materials Science and Engineering must successfully complete a two-day intensive occupational health and safety training program which will normally take place during the week immediately preceding the commencement of graduate courses. More details concerning this course will be provided by the Coordinator of Graduate Studies once admission to a graduate program has been confirmed.

After the initial safety training, all students are required to pass refresher safety training annually.

Materials Science

MSE 1000H^{0}	Graduate Research Seminar MASc
MSE 1004H	Extractive Metallurgy
MSE 1013H	Growth and Characterization of Semiconductors
MSE 1015H	Mechanical Properties of Solids I
MSE 1016H	Mechanical Properties of Solids II
MSE 1022H	Special Topics in Materials Science I
MSE 1023H	Special Topics in Materials Science II
MSE 1024H	Interface and Nanophase Engineering
MSE 1025H	Non-Crystalline Solids
MSE 1026H	Analytical Electron Microscopy
MSE 1028H	Advanced Materials Science
MSE 1029H	Electrochemical Synthesis of Nanomaterials

MSE 1031H	Forensic Engineering
MSE 1032H	Polymers and Composites Engineering (exclusion: MSE 432H)
MSE 1033H	Advanced Rate Phenomena in Materials Processing
MSE 1034H	Directed Readings in Materials Science and Engineering I
MSE 1035H	Optical and Photonic Materials
MSE 1036H	Application of Electrochemical Techniques in Materials Science
MSE 1037H	Process Metallurgy of Iron and Steel
MSE 1038H	Computational Materials Design
MSE 1043H	Polymers and Composites Engineering (exclusion: MSE 432H)
MSE 1044H	Directed Readings in Materials Science and Engineering II
MSE 1051H	Advanced Physical Properties of Structural Nanomaterials
MSE 1058H	Nanotechnology in Alternate Energy Systems
MSE 1061H	Engineered Ceramics
MSE 1062H	Materials Physics
MSE 2000H[0]	Graduate Research Seminar PhD
MSE 3000Y	MEng Project
APS 1012H	Managing Business Innovation and Transformational Change
JDE 1000H	Ethics in Research
JMB 1050H	Biological and Bio-inspired Materials

JMZ 1704H	Polymer Process Engineering
JTC 1020H	Ceramics
JTC 1135H	Applied Surface Chemistry

[0] Course that may continue over a program. The course is graded when completed.