

Change to Program/Graduate Diploma Academic Requirements Proposal Form

The following information is required for all proposals involving a minor modification to program/graduate diploma academic requirements. To facilitate the review/approval process, please use the headings below (and omit the italicized explanations below each heading).

1. Program/Graduate Diploma: MAsC in Civil Engineering

2. Effective Session of Proposed Change(s): Fall 2020

3. Proposed Change(s) and Rationale

The description of and rationale for the proposed modification(s) should provide information with respect to each of the following points:

a) A description of the proposed modification(s) and rationale, including alignment with academic plans.

The proposed modification addresses the need to develop a regulation regarding minimum completion time. The original program brief did not address this issue and was an oversight. The normal program length is two years (six terms) of full-time study. As the program continues to flourish with a growing student body, more courses are offered in a given term, thus allowing students to focus solely on research in certain terms. As such, it is possible for a graduate student to complete the graduate degree earlier than the normal program length by enrolling in more courses per year (or if more courses are offered per year). Thus, the minimum completion time is proposed as 3 terms, whereas the normal completion time remains at 6 terms. Note that when this program was developed, it was just starting up. Therefore, not as many courses were offered initially and as the program has continued to grow with more course offerings, and students are completing earlier than the normal expected time, a revision is necessary.

b) An outline of the changes to requirements and the associated learning outcomes/objectives, including how the proposed requirements will support the achievement of program/graduate diploma learning objectives.

There is no change to requirements and associated learning outcomes/objectives. Students will continue to meet the graduate degree level expectations as set out by the Ontario Council of Academic Vice-Presidents (OCAV).

c) An overview of the consultation undertaken with relevant academic units and an assessment of the impact of the modifications on other programs/graduate diplomas.

The Graduate Program Administration Committee (GPAC) in the Graduate Program of Civil Engineering reviewed and approved the proposed changes. Following this, the Department of Civil Engineering approved the changes. No other programs are impacted by the proposed changes.

d) A summary of any resource implications and how they are being addressed.

There are currently no resource implications; however, if student enrolment increased substantially (e.g. tripled), it may impact teaching load in the program.

e) A summary of how students currently enrolled in the program/graduate diploma will be accommodated.

Students who complete early will benefit from this modification as there will be clarity regarding the minimum completion time of the MASc program.

4. Calendar Copy

Using the following two-column format, provide a copy of the relevant program/graduate diploma requirements as they will appear in the FGS Calendar - <http://gradstudies.yorku.ca/current-students/regulations/program-requirements/>.

Please note: Senate requires that FULL Calendar copy be provided. Please include the entire graduate program/diploma section, not just text that is being revised.

Please clearly and visibly indicate how graduate program/graduate diploma information has been changed using strikethrough (left column), bold, underlining, colours, etc. (right column).

Existing Program/Graduate Diploma Information (change from)	Proposed Program/Graduate Diploma Information (change to)
<p>The Graduate Program in Civil Engineering offers advanced training leading to Master of Applied Science and Doctor of Philosophy degrees. Three main research themes distinguish the program: infrastructure, resilience, and sustainability. Infrastructure rehabilitation and replacement is the principal goal of this theme. Research focuses on above-ground infrastructure, such as roads, bridges, buildings, wastewater treatment facilities, and on buried infrastructure, such as stormwater collection networks, and large-scale tunnels. Other focus areas include intelligent transportation systems and freight transport networks. The resilience theme emphasizes the performance of civil infrastructure during extreme loading events, including fires, and the influence of climate change. The development of novel materials and construction technologies that improve the resilience of civil infrastructure to ensure post-extreme-event functionality, such as earthquakes and floods, is one of the primary objectives. Sustainability research focuses on developing technologies for construction using recycled and renewable materials. Other focus areas include construction over marginal-quality lands, postmining rehabilitation of landscapes, remediation of contaminated groundwater, sustainable building design, and resource recovery.</p> <p>MASTER OF APPLIED SCIENCE PROGRAM</p>	<p>The Graduate Program in Civil Engineering offers advanced training leading to Master of Applied Science and Doctor of Philosophy degrees. Three main research themes distinguish the program: infrastructure, resilience, and sustainability. Infrastructure rehabilitation and replacement is the principal goal of this theme. Research focuses on above-ground infrastructure, such as roads, bridges, buildings, wastewater treatment facilities, and on buried infrastructure, such as stormwater collection networks, and large-scale tunnels. Other focus areas include intelligent transportation systems and freight transport networks. The resilience theme emphasizes the performance of civil infrastructure during extreme loading events, including fires, and the influence of climate change. The development of novel materials and construction technologies that improve the resilience of civil infrastructure to ensure post-extreme-event functionality, such as earthquakes and floods, is one of the primary objectives. Sustainability research focuses on developing technologies for construction using recycled and renewable materials. Other focus areas include construction over marginal-quality lands, postmining rehabilitation of landscapes, remediation of contaminated groundwater, sustainable building design, and resource recovery.</p> <p>MASTER OF APPLIED SCIENCE PROGRAM</p>

ADMISSION REQUIREMENTS

The minimum requirements for admission to the MASc degree program in Civil Engineering is a bachelor's degree (BASc, BEng or equivalent) in Civil Engineering (or a closely-related discipline). A minimum B average in the final two years of the bachelor's degree program is required for admission.

DEGREE REQUIREMENTS

MASc Degree by Thesis

1. Courses

Candidates for the MASc degree are required to successfully complete five one-term courses, at least three of which must be core courses from the subdiscipline in which the student is pursuing the MASc degree. Of the remaining two courses, one can be a technical elective selected either from courses in Civil Engineering that are outside of the subdiscipline, or from courses offered by other graduate programs within the Lassonde School of Engineering or from courses offered by the Graduate Program in Environmental Studies or by the Graduate Program in Geography. The last remaining course can be an open elective, which can either be another technical elective or can be selected from courses offered by other York University Faculties. Of the five one-term courses, a maximum of two can be directed reading courses. The requirements for the MASc degree also include non-credit complementary activities. All MASc students are required to register in the non-credit course Civil Engineering 6000 0.0: Graduate Seminar Series in Civil Engineering for every term during their study period. Each student must attend a minimum of ten graduate seminars and give at least one graduate seminar based on the student's research project. All MASc students are also required to take a non-credit course on engineering ethics offered by the Lassonde School of Engineering, Engineering 6000 0.0: Engineering Ethics.

2. Thesis

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2. Thesis

MASc students are required to register for a non-credit master's thesis course for every term during their study period, Civil Engineering 6002 0.0: MASc Civil Engineering Thesis. A thesis supervising committee is assigned to oversee the student's academic progress, including courses and research. Each MASc student is required to submit an annual progress report. A meeting of the student's supervisory committee is held prior to the completion of the annual progress report. The student may be asked to undergo corrective measures if the supervisory committee finds the student's progress in the program to be unsatisfactory. Each MASc student must submit a thesis on their research project in written form and defend the thesis in an oral examination to a thesis examination committee. Criteria for examining the thesis includes academic excellence, innovation, contribution to the state-of-the-art, and quality of both the written thesis and the oral presentation.

TIME REQUIREMENTS

Normal expected degree completion time for full-time MASc students is 6 terms (2 years). All requirements for a master's degree must be fulfilled within 12 terms (4 years) of registration as a fulltime or part-time master's student in accordance with Faculty of Graduate Studies' registration policies.

DOCTOR OF PHILOSOPHY PROGRAM

ADMISSION REQUIREMENTS

The minimum requirements for admission to the PhD degree program in Civil Engineering are a bachelor's degree (BASc, BEng or equivalent) and a master's degree (MASc, MEng or equivalent) in Civil Engineering (or a closely-related discipline). A minimum B average in the coursework for the master's

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~~The Normal~~ expected degree completion time for full-time MASc students is 6 terms (2 years). **For those MASc students who complete degree requirements earlier than 6 terms, they must register and pay fees for a minimum of the equivalent of 3 terms of full-time study.** All requirements for a master's degree must be fulfilled within 12 terms (4 years) of registration as a fulltime or part-time master's student in accordance with Faculty of Graduate Studies' registration policies.

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degree program is required for admission. The minimum requirement for transfer from the MASc to the PhD degree program in Civil Engineering is successful completion of MASc course requirements with an overall "A" average. In addition, a research plan must be submitted to the supervisory committee for approval in consultation with the Graduate Program Director. It is normally expected that the student making a transfer request will have completed three terms of full-time study after initial registration and no more than five terms of full-time study after initial registration into the MASc program. ☞ *Note that direct entry into the PhD degree program after completing a Bachelor's degree in Civil Engineering (or a closely related discipline) is not permitted.*

DEGREE REQUIREMENTS

1. Courses

Coursework requirements for PhD students fall under one of the following three options:

Option 1: A PhD student with a master's degree in Civil Engineering from York University: The requirement is three half courses, two of which are required to be technical electives plus one open elective. These courses must be different from those taken by the student as part of the student's master's degree program.

Option 2: A PhD student with a master's degree in Civil Engineering (or a closely-related discipline) not from York University: The requirement is three half courses, two of which must be core courses plus one technical elective.

Option 3: A PhD student who has transferred from the MASc degree program to the PhD degree program: The requirement is two half courses, one of which must be a technical elective and the other an open elective. These two required courses must be different from those taken by the student in fulfilling the requirements of the student's master's degree program.

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The requirements for the PhD degree also include non-credit complementary activities.

All PhD students are required to register in the non-credit course Civil Engineering 6000 0.0: Graduate Seminar Series in Civil Engineering for every term during their study period. Each PhD student is required to attend a minimum of ten graduate seminars and give at least two graduate seminars based on the student's research project. Each PhD student is also required to take a non-credit course on engineering ethics offered by the Lassonde School of Engineering, Engineering 6000 0.0: Engineering Ethics, unless the student has previously taken this course as part of the student's master's degree program.

2. Dissertation Course and Supervisory Committee

All PhD students are required to register for a non-credit PhD dissertation course for every term during their study period, Civil Engineering 6001 0.0: PhD Civil Engineering Thesis. A dissertation supervising committee is assigned to oversee the student's academic progress, including courses and research. Each PhD student is required to submit an annual progress report. A meeting of the student's supervisory committee is held prior to the completion of the annual progress report. The student may be asked to undergo corrective measures or, in exceptionally serious cases, withdraw from the program, if the supervisory committee finds the student's progress in the program to be unsatisfactory, regardless of whether the student has successfully completed the PhD comprehensive examination and has met the PhD dissertation proposal presentation and defence requirements.

3. Comprehensive Examination and Research Proposal

Each PhD student is required to pass a PhD comprehensive examination within the first 12 months of the PhD program. Any exceptions must be approved by the Graduate Program Director. Each PhD student is required to present and defend a PhD research proposal to an examination committee within the first 24 months of the student's PhD program in

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the form of a formal written document and open seminar format. Any exceptions must be approved by the Graduate Program Director. Failure of the PhD comprehensive examination or unsuccessful defence of the research proposal after the second attempt will result in a recommendation to the Faculty of Graduate Studies to withdraw the student from the PhD degree program.

4. Dissertation and Defence

Each PhD student is required to submit a thesis in written form and defend the thesis in an oral examination to a PhD thesis examination committee. Criteria for examining the thesis includes academic excellence, innovation, contribution to the state-of-the-art, and quality of both the written thesis and the oral presentation.

TIME REQUIREMENTS

Normal degree completion time for full-time PhD students is 12 terms (4 years). For full-time PhD students who transferred from the MSc program, the normal degree completion time is 12 terms (4 years). All requirements for a doctoral degree must be fulfilled within 18 terms (6 years) of registration as a full-time or part-time doctoral student in accordance with Faculty of Graduate Studies' registration policies.

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Please submit completed forms and required supporting documentation by email to the Coordinator, Faculty Governance– fgsgovrn@yorku.ca

5. Program Structure, Learning Outcomes and Assessment

The intent of this section is to provide reviewers with an understanding of the knowledge, methodologies, and skills students will have acquired by the time they complete the program (i.e. the program learning outcomes), including the appropriateness of the program learning outcomes and how they will be supported and demonstrated. With that in mind, and with explicit reference to the relevant degree level expectations, it would be useful to focus on what students in the program will know and/or be able to do by the end of a defined period of time and how that knowledge, methodology and/or skill will be supported and demonstrated.

5.1 Provide a detailed description of the program learning outcomes and indicate how the program learning outcomes are appropriate and align with the relevant degree level expectations.

The degree level expectations as articulated in the six criteria established by the Ontario Council of Academic Vice-Presidents (OCAV, Table 5.1.1 for the MASc and Table 5.1.2 for the PhD programs) form the benchmark reference for the development of the graduate program in Civil Engineering. The table identifies how these criteria are addressed in the proposed program.

Table 5.1.1: MASc Degree Level Expectations established by OCAV

CRITERION	MASc degree: EXPECTED PERFORMANCE OF GRADUATE This degree is awarded to students who have demonstrated the following:
1. Depth and breadth of knowledge	<i>A systematic understanding of knowledge, including, where appropriate, relevant knowledge outside the field and/or discipline, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice.</i>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>The program aims for a strong technical foundation comprising a broad scope of technical courses including a number of core courses from the area of specialty, or major – the courses are delivered in a modular format to allow greater emphasis in areas of interest, but also to enable, through brief modules the fast updating of course material with state of the art information, and the versatile training in emerging technologies. The context of the program is at the center of current societal concerns regarding Ontario’s ageing infrastructure, needs for sustainability and community resilience to disasters from extreme natural events. A particular objective of the program is to endow the student with technical competence in computational issues required in civil engineering in the areas of modeling and simulation of civil engineering works. A critical awareness of current problems and new insights is promoted through training in research (through a compulsory course on Research Methods that is intended to expose the students to critical assessment of the state of the art in their chosen discipline) before the student embarks on their MASc thesis research. The same objective is also supported by a comprehensive seminar series on all fields of new and emerging research and technology, but also on engineering ethics, economics and business issues related to the civil engineering profession. Professional judgment, cognizance of the field, and soft skills (oral/written) are targeted through several activities (the GSP, the Research Thesis presentation and Defense, and the participation to dissemination activities under the guidance of the supervisor). Interdisciplinary understanding is encouraged by the fact that the program’s directions of emphases cut through the conventional fields of Civil Engineering as illustrated below:</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 20px;"> <p>Conventional Areas:</p> <ul style="list-style-type: none"> Structural Engineering Geotechnical Engineering Hydro-technical Engineering Construction Management Transportation Engineering Environmental Engineering </div> <div style="margin-right: 20px;">  </div> <div style="border: 1px solid black; padding: 5px;"> <p>Interdisciplinary Approach:</p> <ul style="list-style-type: none"> Infrastructure Management, Assessment & Maintenance Resilience to Extreme Events Sustainable development </div> </div>	

CRITERION	MASc degree: EXPECTED PERFORMANCE OF GRADUATE This degree is awarded to students who have demonstrated the following:
2. Research and scholarship	<p><i>A conceptual understanding and methodological competence that</i></p> <p><i>a) Enables a working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline;</i></p> <p><i>b) Enables a critical evaluation of current research and advanced research and scholarship in the discipline or area of professional competence; and</i></p> <p><i>c) Enables a treatment of complex issues and judgments based on established principles and techniques;</i></p>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>An appreciation of research as a means of knowledge generation and advancement is sought through several activities in the program – these include:</p> <ul style="list-style-type: none"> -A compulsory course on research methodology – with particular emphasis on the management of data (including statistical methods) (L2 Module), design of experiments and in the critical assessment of the state of the art (L3 Module). -A leap in understanding the complexity of the field is attempted through the GSP (Graduate Studies Proposal) which is articulated individually by each student orienting their study-plan with reference to the context of the program in the directions of Infrastructure, Sustainability and Resilience under extreme events. -Contribution in the area of knowledge creation or advancement through the research conducted for the MASc Thesis; work conducted is meant to train highly-qualified engineers in establishing and carrying out a research plan and in consistent interpretation of research findings. 	
2. Research and scholarship	<p><i>and, On the basis of that competence, has shown at least one of the following:</i></p> <p><i>a) The development and support of a sustained argument in written form; or</i></p> <p><i>b) Originality in the application of knowledge.</i></p>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>Important actions are planned in the training program to enhance student capabilities to formulate and defend an argument, such as for example the delivery of the Thesis oral defense lecture in front of an audience of experts and in the graduate student workshop, as well as in the authorship of the GSP and the MASc thesis volume. Originality in the application of knowledge is promoted in the several projects conducted throughout the period of studies required by the graduate coursework.</p>	
3. Level of application of knowledge	<p><i>Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.</i></p>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>The student by conducting independent research and participating in all the creative activities associated with the thesis project with guidance resulting in the creation of know knowledge or the novel application of existing knowledge. The program is designed and structured so as to provide plenty of opportunities for the student to test their ability in applying the body of knowledge when dealing with an emerging new issue in Engineering. In fact, a significant fraction of the student engagement through projects (GSP, MASc Thesis), and seminars is intended to enhance the abilities and technical skills required to tackle difficult engineering problems over all the phases ranging from conceptual issues (ethical, fiscal and business considerations) to purely technical (e.g. computer aided simulation). This competence and overall understanding are expected to be further improved through participation of the students to the Departmental Seminar sessions as well as in the complementary courses offered by the Lassonde School on professional development.</p>	

CRITERION	MASc degree: EXPECTED PERFORMANCE OF GRADUATE This degree is awarded to students who have demonstrated the following:
4. Professional capacity/autonomy	<p><i>a) The qualities and transferable skills necessary for employment requiring:</i></p> <p><i>i) The exercise of initiative and of personal responsibility and accountability; and ii) Decision-making in complex situations;</i></p> <p><i>b) The intellectual independence required for continuing professional development;</i></p> <p><i>c) The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and</i></p> <p><i>d) The ability to appreciate the broader implications of applying knowledge to particular contexts.</i></p>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>Special emphasis is placed on the ethics in engineering and on professional competence in the form of the so-called soft skills (i.e. skills not strictly associated with engineering technical practice but however considered essential equipment for professional standing). Many of these skills are developed through practical implementation of the program requirements – for example, the blended learning approach which will be used in courses with a modular structure is designed to enhance intellectual independence for continuing professional development. The compulsory attendance of the seminar series which place emphasis on the emerging sciences and technologies and on Ethical and Business issues are intended to enhance the personal professional integrity of the individual and their sense of responsibility as professional engineers towards the society. The same is intended by the compulsory course on Engineering Ethics and one of the following two complementary courses offered for credit from the Lassonde School of Engineering:</p> <p>(a) GS/ENG 6001 Legal Aspects and Governance in Engineering, (b) GS/ENTR 4500 Entrepreneurship and Technology Ventures</p> <p>Also, the experience gained through TA-ing enhances the ability of the graduates to work in teams in a professional environment and to articulate concepts and ideas. The same is targeted for through the thesis research experience (planning and carrying out advanced level engineering work) and its defense to an expert audience. Major and minor emphases in two of the three emerging areas of Civil Engineering (Infrastructure-Resilience-Sustainability) require of the student through their GSP to position in this different framework the conventional, technical subdivision of knowledge.</p>	
5. Level of communications skills	<p><i>The ability to communicate ideas, issues and conclusions clearly.</i></p>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>Communication skills are systematically cultivated in the program through several activities including written projects (authoring the Research Thesis, and the GSP), delivery of thesis defense lecture in audience, and through the L1 module of the course on Research Methodology.</p>	
6. Awareness of limits of knowledge	<p><i>Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.</i></p>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>The students are encouraged to broaden their scope through the compulsory participation in Seminars presenting talks on emerging sciences and technologies. The interaction between the program emphases (Infrastructure, Resilience and Sustainability) becomes a focal point of reference for the students, in articulating through the GSP their own graduate studies profile. The modular format of the program, including many complementary L2 level modules enables speedy adjustment of the course material recognizing the evolution of the center of gravity of the state of the art. The graduate student has to complete their MASc thesis which, in the thesis defense, gives a clear definition of ones' own research contribution, limitations and future scope of the research study.</p>	

Table 5.1.2: PhD Degree Level Expectations established by the OCAV

CRITERION	PhD degree: EXPECTED PERFORMANCE OF GRADUATE This degree extends the skills associated with the Master's degree and is awarded to students who have demonstrated the following::
1. Depth and breadth of knowledge	<i>A thorough understanding of a substantial body of knowledge that is at the forefront of their academic discipline or area of professional practice including, where appropriate, relevant knowledge outside the field and/or discipline.</i>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>The program builds on strong technical foundation of MASc graduates who continue on to obtain a doctorate. Breadth and depth of understanding and knowledge are assessed early in the degree program through the comprehensive exam of the student's technical competence and the background. Research capabilities, if they were not already assessed at the Master Degree level, will be demonstrated through a mandatory independent study project with the student's supervisor before he/she is finally admitted to the degree (advancement to candidacy). – Continuing on with the same mode of delivery as in the MASc degree, required courses are delivered in a modular format to allow greater emphasis in areas of interest; however at this stage of the candidate's training the emphasis is placed on the PhD Thesis research where the student demonstrates the depth and breadth of understanding by organizing and carrying out original work either on basic or on applied research, dealing with emerging or unsolved engineering challenges, in the general context of the graduate Civil Engineering program (infrastructure, needs for sustainability and community resilience to disasters from extreme natural events). A particular objective of the program is to endow the student with technical competence in simulation, either through experiment (Laboratory / Field Work) or through Computation – these attributes will be sought as assessment criteria of the research methodology pursued by the candidate, in the annual evaluation of the student's progress. Enhancing knowledge outside the field is cultivated through the compulsory attendance of graduate seminars on all fields of new and emerging research and technology, and three compulsory courses from the Lassonde School of Engineering, one being a non-credit course on Engineering Ethics and the other two being credit-based courses for professional development. Professional judgment, cognizance of the field, and soft skills (oral/written) are also targeted through the participation of the student in the delivery of the Undergraduate program in the role of Teaching Assistant as well as the required dissemination activities as pre-requisites to thesis submission. Student progress is evaluated on an annual basis, particularly with reference to dissemination of his/her research findings to international expert audiences.</p>	
2. Research and scholarship	<p><i>a) The ability to conceptualize, design, and implement research for the generation of new knowledge, applications, or understanding at the forefront of the discipline, and to adjust the research design or methodology in the light of unforeseen problems;</i></p> <p><i>b) The ability to make informed judgments on complex issues in specialist fields, sometimes requiring new methods; and</i></p> <p><i>c) The ability to produce original research, or other advanced scholarship, of a quality to satisfy peer review, and to merit publication.</i></p>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>The quintessence of this criterion is embedded in the preparation of the Doctoral Dissertation. Several actions are intended to bring out and cultivate such characteristics as would prepare the candidate in his role as a future expert researcher or principal-investigator in his/her subsequent career. Research as a means of knowledge generation and advancement is evaluated critically in every step of the thesis production, through (1) The Annual Progress Report submitted to the Faculty of Graduate Studies by the supervisory committee who evaluates the student's performance in developing and adhering to a research methodology and research plan, (2) The requirement that at least two journal papers drawn from the Thesis Research are authored and submitted for review by the time of graduation, (3) The requirement that the student has participated in conference presentations of research findings, (4) The final evaluation of the research work by committee of experts at final defense. The above chain of requirements is intended to consolidate informed critical judgment at the forefront of the chosen discipline and academic scholarship.</p>	

CRITERION	PhD degree: EXPECTED PERFORMANCE OF GRADUATE This degree extends the skills associated with the Master's degree and is awarded to students who have demonstrated the following::
3. Level of application of knowledge	<i>The capacity to</i> <i>a) Undertake pure and/or applied research at an advanced level; and</i> <i>b) Contribute to the development of academic or professional skills, techniques, tools, practices, ideas, theories, approaches, and/or materials.</i>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>The PhD thesis research is in line with this criterion, since the requirement for approval of the candidate's Research plan through the many evaluation steps outlined above are intended to secure the originality and innovation of the work. The thesis represents independent work conducted by the student that involves planning and solving of scientific problems to lead to the advancement of knowledge. Contribution to the state of the art will be certified not only by the members of the PhD Thesis Committee but through the interaction and peer evaluation received upon dissemination of the results to Journals and Conferences which are pre-requisite to conferring the degree. Furthermore, the student's engagement through the seminars series is intended to enhance the abilities and technical skills required to tackle difficult engineering problems over all the phases ranging from conceptual issues (ethical, fiscal and business considerations) to purely technical (e.g. computer aided simulation).</p>	
4. Professional capacity/autonomy	<i>a) The qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and largely autonomous initiative in complex situations;</i> <i>b) The intellectual independence to be academically and professionally engaged and current;</i> <i>c) The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and</i> <i>d) The ability to evaluate the broader implications of applying knowledge to particular contexts.</i>
<p>PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION:</p> <p>Special emphasis is placed on the ethics in engineering and on professional competence in the form of the so-called soft skills (i.e. skills not strictly associated with engineering technical practice but however considered essential equipment for professional standing). Many of these skills are developed through practical implementation of the program requirements – for example, the blended learning approach which will be used in courses with a modular structure is designed to enhance intellectual independence for continuing professional development. The compulsory attendance of the Engineering Ethics course (ENG6000) and the seminar series which place emphasis on the emerging sciences and technologies and on Ethical and Business issues are intended to enhance the personal professional integrity of the individual and their sense of responsibility as professional engineers towards the society. The responsibility placed by the supervisory committee on the student, in developing his/her research methodology and research plan, which is revisited on an annual basis, aims to enhance the ability for decision making in complex situations and the intellectual independence and autonomy commensurate to the professional qualification conferred with the Doctoral Degree. To this end, the doctoral student is expected to attend one of the following graduate courses offered by the Lassonde School, on professional development, which will be critical in strengthening the students' confidence in their appreciation of the economic climate and professional opportunities:</p> <p>(a) LE/GS/MENG 6001 Legal Aspects and Governance in Engineering, (b) ENTR 4500 Entrepreneurship and Technology Ventures</p> <p>Furthermore, teaching and Research Assistantships granted to the graduate students are also intended to benefit them by giving them intellectual responsibilities with professional-level expectations that go through procedures of formal evaluation.</p> <p>Personal responsibility and accountability is cultivated through the requirements of annual meeting with the supervisory committee and submission of the Annual Activity Report that outlines progress made since the last meeting.</p>	

CRITERION	PhD degree: EXPECTED PERFORMANCE OF GRADUATE This degree extends the skills associated with the Master's degree and is awarded to students who have demonstrated the following::
5. Level of communications skills	<i>The ability to communicate complex and/or ambiguous ideas, issues and conclusions clearly and effectively.</i>
PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION: Communication skills are systematically cultivated in the program through several activities including written projects (Dissertation Volume, papers), participation of dissemination activities with presentations to expert audiences, and through the L1 module of the course on Research Methodology. TA duties in the undergraduate program, which are subject to anonymous evaluation by the students, have an important contribution towards the doctoral candidate's training in communication of complex concepts.	
6. Awareness of limits of knowledge	<i>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.</i>
PROGRAM ATTRIBUTE TOWARDS ACHIEVING THE CRITERION: The students are encouraged to broaden their scope through the compulsory participation in Seminars presenting emerging sciences and technologies. The interaction between the program emphases (Infrastructure, Resilience and Sustainability) becomes a central point of reference in formulating the scope of research conducted in the department by its doctoral students. The modular format of the program, including many complementary L2 level modules enables speedy adjustment of the course material recognizing the evolution of the center of gravity of the state of the art. A most important contribution towards realization of one's own limits is the participation of the student in national and international conferences with presentations of research findings. The graduate student has to complete their PhD Dissertation which gives a clear definition of ones' own research contribution, limitations and future scope of the research study.	

5.2 Address how the program curriculum and structure supports achievement of the program learning outcomes. For research-focused graduate programs, comment on the nature and suitability of the major research requirement(s) for degree completion. For undergraduate programs, comment on the nature and suitability of students' final-year academic achievement in the program.

The basic components of the curriculum outlined in Table 4.1.1, have been discussed in detail with reference to the learning outcomes according with the established criteria set by the OACV, in the corresponding cells of Table 5.1.1 and 5.1.1. The graduate program is focused in research, combining a moderate emphasis in advanced level coursework intended to endow the students with the technical skills beyond what they obtained during their undergraduate study, so as to be competent in the application of advanced methods and techniques from the body of knowledge; complementary training in the form of credit and non-credit activities are included in order to provide the students with additional capabilities in the areas of professional development including communication, ethics, business, and the legal framework of engineering operation.

The primary achievement of the student is production and defense of a Research Thesis in an original area of study with documented contribution to the state of the art and in creation of new knowledge, to an extent and intensity that is commensurate to the degree level. Each graduate student is supervised by a departmental faculty member and is engaged in research immediately upon joining the program. The research progress and output are monitored and evaluated by a supervisory committee appointed according with the procedures set by the Faculty of Graduate Studies. The program is structured by design to achieve the research objectives listed in Tables 5.1.1 and 5.1.2, through a multi-stage assessment procedure of the research conducted; however attainment of the learning objectives takes advantage of the relevant course based activities (e.g. compulsory participation in the department's seminar series). By systematically engaging the graduate student to activities of communication of their research findings, either to the supervisory committees, the thesis defense, seminar participation, and dissemination of findings in national and international forums, the program intends to instill the students with professional attitude towards their work, their peers, and their discipline in general.

5.3 Address how the methods and criteria for assessing student achievement are appropriate and effective relative to the program learning outcomes and Degree Level Expectations.

Student’s performance will be evaluated using a range of assessment tools that refer both to performance in courses taken and progress in research. Thus in courses that are organized in modules, the student will be evaluated upon completion of each module. Tests and quizzes, assignments and exams will be used in courses of a generic content. Multidisciplinary or advanced design courses will be graded based on project work, field work, experimental work, and oral/written presentations against the learning targets listed in Tables 5.1.1 and 5.1.2.

Defense of graduate thesis will be evaluated by an examination committee appointed as per the FGS regulations. Written Reports and oral presentations will be marked using the following rubric: 15% for quality of presentation material and delivery, 25% for critical assessment of the state of the art, 25% for completeness of work, and 40% for quality of work conducted (content). The above methods are intended to highlight a range of the students’ capabilities as described in detail in the following table:

Criterion	Evaluation Method	Evaluation Scheme
1. Depth and breadth of knowledge	Exams, Tests, Quizzes Assignments, Written Reports & Projects	$\geq 60\%$ of course mark $\leq 40\%$ of course mark
2. Research and scholarship 3. Level of application of knowledge 6. Awareness of limits of knowledge	Written Reports & Oral presentations	10-20% for quality of presentation material, 20-25% for critical assessment of the state of the art 20-30% for completeness of work, 40-50% for content
4. Professional capacity/ autonomy 5. Level of communications skills	Research Plans and Methodology Research Report & Projects (individual)	10-20% for quality of presentation material and delivery, 20-30% for completeness of work, 20-30% for Innovative Aspects, 40-50% for content

With regards to each of the learning objectives detailed in the preceding, student assessment criteria and methods, and their alignment with GDLEs of the MASc and PhD programs are detailed in the Tables 5.3.1 and 5.3.2 (on the next two pages).

Table 5.3.1: Methods and Criteria for the Assessment of MASc Degree Level Expectations (DLEs)

DLE	Assessment Methods and Criteria
1- Depth and Breadth of Knowledge	<p><u>It is expected that every MASc student will:</u></p> <ul style="list-style-type: none"> - Successfully defend their MASc thesis in an examination session following the guidelines specified by the Faculty of Graduate Studies at York University. - Obtain a minimum grade of B- in the required coursework. - Submit Annual Progress Reports (APRs) and demonstrate satisfactory progress in research project between two successive APRs. - Deliver at least one presentation at the Department's Annual Graduate Symposium. - Attend 10 departmental seminars to receive a pass grade in the non-credit Graduate Seminar course.
2- Research and Scholarship	<ul style="list-style-type: none"> - Research progress is mainly assessed by the supervisor on the basis of one-to-one or group meetings. - The MASc thesis will be evaluated by a committee with domain knowledge expertise and one graduate faculty member at arm's length from the dissertation, usually from outside the Department. - Students must successfully defend their thesis in Oral Examination which also will be assessed by the examination committee following FGS guidelines - Attend 10 departmental seminars to receive a pass grade.
3- Level of Application of Knowledge	<ul style="list-style-type: none"> - Participate under guidance to dissemination of research results – activity reflected in the Annual Progress Report (APR) and evaluated. - Level of application of knowledge is assessed by the supervisor and the consideration of the student performance in his/her coursework.
4- Professional Capacity / Autonomy	<ul style="list-style-type: none"> - Students are expected to receive a pass grade on a mandatory Engineering Ethics course. - Students are expected to pass all the credit course requirements - Students should be able to create design solutions and/or develop research programs that take ethical, social, environmental, legal, and regulatory influences into account
5- Level of Communication Skills	<ul style="list-style-type: none"> - Presentation skills will be evaluated during the Departmental Workshop event by two faculty members as session referees, and fellow graduate students. Evaluations will be used to determine for selection of the best presenter - Students' Activity Reports will be assessed by the supervisor and members of the Graduate Studies Committee on a yearly basis. - These will be evaluated by examination committees following instructions provided by FGS
6- Awareness of Limits of Knowledge	<ul style="list-style-type: none"> - Students are expected to include a section in their theses to discuss the limitations and future directions of the conducted research.