



FINAL ASSESSMENT REPORT

February 10, 2020

Master of Engineering in Nuclear Engineering, Graduate Diploma in Nuclear Design Engineering, and Graduate Diplomas in Nuclear Technology Program Review

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Under Ontario Tech University's Quality Assurance Framework, all degree programs are subject to a comprehensive review every eight years to ensure that they continue to meet provincial quality assurance requirements and to support their ongoing rigour and coherence. Program reviews involve several stages, including:

1. A comprehensive and analytical self-study brief developed by members of the program under review.
2. A site visit by academic experts who are external to and arm's length from the program who prepare a report and recommendations on ways that it may be improved based on a review of the program's self-study and supporting material, and a two-day site visit involving discussions with faculty, staff and students and a tour of the facilities.
3. Development of a plan for improvement by the program and proposed timelines for implementation.

On the completion of the program review, the self-study brief together with the reviewers' report and the assessment team's response are reviewed by the appropriate standing committee of Academic Council, and are subsequently reported to Academic Council, the Board of Governors and the Quality Council.

In academic years 2016-2017 a program review was scheduled for the Master of Engineering in Nuclear Engineering, Graduate Diploma in Nuclear Design Engineering and Graduate Diplomas in Nuclear Technology.

This is the first program review for this program and the internal assessment team is to be commended for undertaking this assignment in addition to an already challenging workload and within a very tight timeline. The following pages provide a summary of the outcomes and action plans resulting from the review, identifying the strengths of the program as well as the opportunities for program improvement and enhancement. A report from the program outlining the progress that has been made in implementing the recommendations will also be put forward in eighteen months' time.

External Reviewers: Dr. Adriaan Buijs – McMaster University, Dr. Jin Jiang – Western University, and Mr. Mark Knotson – Ontario Power Generation

Site Visit: March 14 and 15, 2019

Program Overview

Master of Engineering in Nuclear Engineering

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. Each course is instructed by experts in the subject matter with the support of a multi-disciplinary team of scientific and engineering faculty. Students have the opportunity to engage in an in-depth study of particular problems that emphasize theory and/or applications.

Graduate Diploma in Nuclear Design Engineering and Graduate Diplomas in Nuclear Technology

The Graduate Diploma programs were developed in response to demand from the nuclear industry for specific grouping of courses that would develop and enhance specialized knowledge in specific areas of the industry. These programs are stand-alone, direct-entry diplomas designed to suit the needs of a particular clientele or market (i.e., not additional to the master's or doctoral program) developed by a unit already offering a master's (and sometimes a doctoral) program.

In addition to the set of six Graduate Diplomas in Nuclear Technology, consultation with Ontario Power Generation identified a specific need for an additional Graduate Diploma in Nuclear Design Engineering. Initially the program was intended for advanced students working in the nuclear industry who are either performing nuclear design-related activities or intend to as part of their career plans. However, once implemented, the program was also available to other graduate students in the Faculty of Energy Systems and Nuclear Science who were interested in the courses offered in the program, often with a view for a career in the nuclear power industry.

Significant Strengths of the Program

- With the only undergraduate nuclear engineering program in Canada, Ontario Tech University has the core faculty complement and a wide range of graduate courses to offer students enrolled in the MEng and GDip programs. The location of the University in Durham Region in close proximity to two large nuclear plants, Ontario Power Generation's (OPG) head office, and several companies in the nuclear supply chain, gives excellent access to experts with unique and current knowledge, as well as broad demand for the programs by the people employed within, or seeking jobs with these companies.
- The two fields in the MEng program - Nuclear Power and Radiological and Health Physics - provide opportunities for students to pursue the set of courses best suited to their career aspirations.
- Being able to choose from six areas of specialization in the GDip in Nuclear Technology program, each student can focus on the area that best matches his/her current interest, and as career opportunities arise, taking subsequent GDip programs promotes \life-long learning.

- A reflection of the close working relationship between FESNS and the nuclear industry is the development of the GDip in Nuclear Design Engineering program that took place in response to specific needs identified in the design departments of Ontario Power Generation.
- The curriculum is oriented towards application in the nuclear industry. There is a close interaction between the instructors in the program and the experts in industry, which ensures that the curriculum dovetails well with the needs of the stakeholders. Furthermore, the programs include hands-on experience when possible, e.g. in the use of the nuclear power plant simulators.
- The accommodation for distant learning was judged to be excellent and several students had identified this as the only way they could have completed the program. Students also indicated that the quality of the learning and faculty support were excellent.

Opportunities for Program Improvement and Enhancement

- Need to provide more industry project topics for the students which may increase the number of students electing to do projects, in lieu of two courses. Industry involvement in this area is required along with some funding support.
- Isotope-related topics such as production and medical uses should be included in the program.
- Implement an advertising strategy that increases awareness of the programs in companies that support and supply the nuclear industry in order to increase the student enrolment.
- More effective use of projects and project rooms to allow students to interact with each other.

The External Review

The site visit took place on March 14 and 15, 2019. Dr. Adriaan Buijs, Dr. Jin Jiang, and Mr. Mark Knotson met with members of the Faculty as well as key stakeholders at the University, including Dr. Robert Bailey – Interim Provost and Vice-President Academic, Dr. Langis Roy – Dean, School of Graduate and Postdoctoral Studies, Dr. Akira Tokuhiko – Dean, Faculty of Energy Systems and Nuclear Science, Dr. Glenn Harvel – Associate Dean, Centre for Institutional Quality Enhancement, and members of the internal assessment team and a number of faculty, staff, and students.

The Faculty was grateful for the thoughtful and thorough review provided. The external reviewers recognized the high quality of the faculty, the rigorousness of the program, and the innovation in the content and delivery of the programs.

The reviewers identified fifteen recommendations, some of which have multiple components. The Faculty values the recommendations and have been very thoughtful in their responses.

Summary of Reviewer Recommendations and Faculty Responses

Recommendation 1

Each course in the MEng program should be evaluated using the criteria for degree-level expectations outlined in the Ontario Tech University Quality Assurance Handbook.

Response

The FESNS faculty and its Dean agree with the recommendation. The review will be completed before Fall 2020 with a view to individual courses within the overall program learning outcomes.

Recommendation 2

Core courses should be defined for each field to ensure that the required levels of learning outcomes are achieved. The selection of the core courses by each student should recognize the program of studies taken and grades achieved at the undergraduate level and/or subsequent practical experience, and the selection of courses, and any subsequent changes, be approved by the FESNS Graduate Program Director or delegated to a faculty member with the appropriate level of expertise.

Response

The FESNS faculty and its Dean agree with the recommendation and will prepare a proposal for core courses in the MEng program to be presented to the Faculty Graduate-Program Committee for review. Revisions to the Graduate Calendar description of MEng program requirements are expected to be in place before Fall 2020.

Recommendation 3

The admission process for the MEng and GDip programs offered by FESNS, and in particular the admission form the students are required to complete, should be designed specifically to match the needs of the MEng and GDip programs, and should contain only the information relevant to assessing the likelihood of the applicant's success in the respective program.

Response

The FESNS faculty and its Dean agree with the need to improve the admission process, especially for non-standard students. FESNS will recommend changes to the admission forms before November 2019 for consideration by the School of Graduate and Postdoctoral Studies by Fall 2020.

Recommendation 4

The tuition for all GDip programs offered by FESNS, as well as the MEng in Nuclear Engineering, should be changed from "flat-fee" to "fee-per-credit", and the restrictions in terms of full-time versus part-time studies be eliminated. Changing the fee structure for the GDip and the MEng programs offered by FESNS from a "flat-fee" to a "fee-per-credit" system would also help to attract additional students to these programs.

Response

The FESNS faculty and its Dean agree with the recommendation. The Faculty will discuss feasibility of this approach with the School of Graduate and Postdoctoral Studies and the Office of the Registrar, taking into consideration system capabilities, effect on programs sharing courses (i.e. MAsC, PhD), potential for increased manual processes, and consistency with other professional graduate programs.

Recommendation 5

A means test (or entrance exam) approach should be established that provides clearly defined criteria and objectives that would allow non-traditional applicants to demonstrate academic potential to succeed in (and therefore to be admitted to) a GDip program, and to enhance the opportunities for students who have succeeded in the GDip program to transfer to the MEng, and possibly to the MAsC programs that are offered by FESNS.

Response

The FESNS faculty and its Dean agree with the recommendation. The Faculty will explore with SGPS possible adaptations of the current NSA (non-standard applications) admissions process, so as to potentially include FESNS-specific provisions for streamlined processing of such non-traditional applicant profiles. The resulting adaptations are expected no later than Fall 2020 admissions.

Recommendation 6

FESNS should develop a Master of Nuclear Technology program that compliments the MEng program for students who do not intend to practise as a professional engineer, but are seeking to have a productive career in the nuclear industry. In addition to technical content, such a program should include social, economic, business and political considerations, and be open to non-traditional applicants from fields other than engineering and the physical sciences.

Response

The FESNS faculty and its Dean agree with the development of programs that include other aspects of nuclear technology. FESNS is currently collaborating with the IAEA INMA group (International Nuclear Management Academy). We have issued a Notice of Intent to the Provost for the creation of a Graduate Diploma in Nuclear Technology Management (GDip NTM). We anticipate approval to prepare a proposal by July 2019. The development of the GDip in NTM shall complement the existing GDip in Nuclear Design. Once the GDip in NTM is developed, a Notice of Intent shall be submitted to the Provost for the establishment of a Master of Engineering in Nuclear Technology Management consistent with the guidelines established by the IAEA INMA program. The GDip in NTM proposal shall be a joint collaboration with the Faculty of Business and IT and shall incorporate elements of the nuclear industry. The proposal shall be submitted for approval by November 2019. The Notice of Intent for the M. Eng. In NTM shall be submitted by October 2019 with the intent to offer the program for the Fall of 2021.

Recommendation 7

Courses in the MEng program should be reviewed for their continued relevance to the program, by considering the demand for each course (frequency and class size) in all the graduate programs.

Response

The FESNS faculty and its Dean agree with the recommendation. The review will be completed before Fall 2020.

Recommendation 8

The list of graduate faculty and associate graduate faculty should be reviewed, and professors who have not taught a graduate course or supervised a graduate student project in the previous five years, and have no specific expectations of teaching a graduate course or to supervise a graduate student project in the next three years, be removed from the list of graduate faculty associated with FESNS.

Response

The FESNS faculty and its Dean agree with the recommendation. In fact, the university's current graduate faculty appointment policy calls for such an assessment at the time of program review (i.e. at this time). The review will be completed, and changes posted before Fall 2020.

Recommendation 9

Each of the six specialties in the Graduate Diploma in Nuclear Technology program should be reviewed for continued relevance to the program, by considering the demand for each specialty, including the number of students currently enrolled and the number having graduated from the specialty. Reducing the number of specialties offered should also be considered.

Response

The FESNS faculty and its Dean agree with the recommendation. The review will be completed before Fall 2020.

Recommendation 10

The courses in each specialty of the GDip in NT program should be reviewed for their continued relevance to the program, by considering the number of GDip students in the given specialty who have or are projected to take the course. The need for adding and/or the deleting courses offered in one or more specialties is to be also considered.

Response

The FESNS faculty and its Dean agree with the recommendation, and implementation will be conducted in conjunction with the plans for Recommendation 9.

Recommendation 11

Student evaluation of graduate courses should be conducted in a manner similar to undergraduate courses, and assuming that no student feedback is requested when there are fewer than six students in a course in order to maintain anonymity.

Response

The FESNS faculty and its Dean agree with the recommendation. A university-wide Working Group has already been formed by SGPS to set up systematic course feedback surveys at the graduate level. FESNS will have input to this process. Implementation is expected to begin in the 2020-2021 academic year.

Recommendation 12

Need to provide more industry project topics for the students which may increase the number of students electing to do projects, in lieu of two courses. Industry involvement in this area is required along with some funding support.

Response

The FESNS faculty and its Dean agree with the recommendation. Discussions are underway with industry partners and additional project topics are anticipated before Fall 2020.

Recommendation 13

Isotope-related topics such as production and medical uses should be included in the program.

Response

The FESNS faculty and its Dean agree with the recommendation. Proposals for introducing such content will be brought to the Faculty Graduate-Program Committee for review by Spring 2020.

Recommendation 14

Implement an advertising strategy that increases awareness of the programs in companies that support and supply the nuclear industry in order to increase the student enrollment. Also, this advertising should be directed towards students who did not obtain their degrees from Ontario Tech.

Response

The FESNS faculty and its Dean agree with the recommendation and targeted advertising to employees at OPG, Bruce Power and member companies of Organization of Canadian Nuclear Industries.

Recommendation 15

Due to the diverse backgrounds and the availability of the students attending classes in person, the collaborative learning among students is challenging. Some efforts might be made to enhance such collaborations among students. A suggestion is to make more effective use of projects and project rooms to allow students to interact with each other. Furthermore, some MEng students from industries can be encouraged to serve as potential industrial 'advisors' for some undergraduate student projects to enhance their own learning and also benefit other programs in the faculty.

Response

The FESNS faculty and its Dean agree with the recommendation. An initial list of collaborations and project rooms will be identified before Fall 2020, along with any potential changes to course descriptions.

Plan of Action

The table below presents a timeline of the actions planned to address the recommendations from the external report.

Recommendation	Proposed Follow-Up	Responsibility for Leading Follow Up*	Timeline	Resources/Support Needed
<i>Each course in the MEng program should be evaluated using the criteria for degree-level expectations outlined in the Ontario Tech Quality Assurance Handbook.</i>	Prepare degree-level expectations for courses	GPD/course instructor	October 2020	Within existing work program
<i>Core courses should be defined for each field to ensure that the required levels of learning outcomes are achieved.</i>	Define core courses for each field	GPD, George Bereznai	October 2020	Within existing work program
<i>The admission process for the MEng and GDip programs offered by FESNS, and in particular the admission form the students are required to complete should be designed specifically to match the needs of the MEng and GDip programs, and should contain only the information relevant to assessing the likelihood of the applicant's success in the respective program.</i>	Revise admission processes for the MEng and GDip programs	GPD, George Bereznai	September 2020	Within existing work program
#4 <i>"The tuition for all GDip programs offered by FESNS, as well as the MEng in Nuclear Engineering, should be changed from "flat-fee" to "fee-per-credit", and the restrictions in terms of full-time versus part-time studies be eliminated. Changing the fee structure for the GDip and the MEng programs offered by FESNS from a "flat-fee" to a "fee-per-credit" system would also help to attract additional students to these programs.</i>	Recommend fee-per-credit tuition for MEng and GDip offered by FESNS	GPD, George Bereznai	September 2020	Within existing work program
<i>A means test (or entrance exam) approach should be established that provides clearly defined criteria and objectives that would allow non-traditional applicants to demonstrate academic potential to succeed in (and therefore to be admitted to) a GDip program, and to enhance the opportunities for students who have succeeded in the GDip program to transfer to the MEng,</i>	Develop entrance exams for non-traditional GDip applicants	GPD, George Bereznai	September 2020	Within existing work program – efforts underway

<i>and possibly to the MASc programs that are offered by FESNS.</i>				
<i>FESNS should develop a Master of Nuclear Technology program that compliments the MEng program for students who do not intend to practise as a professional engineer, but are seeking to have a productive career in the nuclear industry. In addition to technical content, such a program should include social, economic, business and political considerations, and be open to non-traditional applicants from fields other than engineering and the physical sciences.</i>	Submit a Notice of Intent (NOI) to develop a Master of Nuclear Technology program	GPD, George Bereznai	October 2020	Within existing work program
<i>Courses in the MEng program should be reviewed for their continued relevance to the program, by considering the demand for each course (frequency and class size) in all the graduate programs.</i>	Eliminate graduate courses that have not met enrollment expectations	GPD, George Bereznai	October 2020	Within existing work program
<i>The list of graduate faculty and associate graduate faculty should be reviewed, and professors who have not taught a graduate course or supervised a graduate student project in the previous five years [...] be removed from the list of graduate faculty associated with FESNS.</i>	Remove inactive names from the list of graduate faculty associated with FESNS	GPD, George Bereznai	October 2020	Within existing work program
<i>Each of the six specialties in the Graduate Diploma in Nuclear Technology program should be reviewed for continued relevance to the program, by considering the demand for each specialty, including the number of students currently enrolled and the number having graduated from the specialty. Reducing the number of specialties offered should also be considered.</i>	Reduce the number of specialties offered in the GDip NT program	GPD, George Bereznai	October 2020	Within existing work program
<i>The courses in each specialty of the GDip in NT program should be reviewed for their continued relevance to the program, by considering the number of GDip students in the given specialty who have or are projected to take the course. The need for adding and/or the deleting courses offered in one or more specialties is to be also considered.</i>	Reduce the number of specialties offered in the GDip NT program	GPD, George Bereznai	October 2020	Within existing work program

<i>Student evaluation of graduate courses should be conducted in a manner similar to undergraduate courses, and assuming that no student feedback is requested when there are fewer than six students in a course in order to maintain anonymity.</i>	Recommend to Grad Studies to have institutional management of student feedback for grad courses with six or more students	GPD, George Bereznai	October 2020	Within existing work program
<i>Need to provide more industry project topics for the students which may increase the number of students electing to do projects, in lieu of two courses. Industry involvement in this area is required along with some funding support.</i>	Seek to provide more industry project topics	GPD, Markus Piro	November 2020	Within existing work program
<i>Isotope-related topics such as production and medical uses should be included in the program.</i>	Add project topics and courses in Isotope-related topics	GPD, Rachid Machrafi	November 2020	Within existing work program
<i>Implement an advertising strategy that increases awareness of the programs in companies that support and supply the nuclear industry in order to increase the student enrollment.</i>	Implement an advertising strategy to increase awareness of the programs	GPD, Dean	November 2020	Within existing work program – support from Advancement sought
<i>Due to the diverse backgrounds and the availability of the students attending classes in person, the collaborative learning among students is challenging [...] A suggestion is to make more effective use of projects and project rooms to allow students to interact with each other.</i>	Make more effective use of projects and project rooms to allow students to interact with each other	GPD, Dean	November 2020	Within existing work program

*The Dean of the Faculty, in consultation with the Program Review Chair shall be responsible for monitoring the Implementation Plan. The details of progress made will be presented to Academic Council and the Board of Governors and filed in the Office of the Provost and Vice-President (Academic).

Due Date for 18-Month Follow-up on Plan of Action: December 22, 2020

Date of Next Cyclical Review: 2023-2025