UNIVERSITY NETWORK OF EXCELLENCE IN NUCLEAR ENGINEERING

PROGRAM DIRECTOR'S REPORT

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1. Program Summary

The UNENE education program continues according to the work plan established at the beginning of the academic year, and following agreements and contracts made by UNENE with other organizations for training course delivery.

The UNENE management continues to make efforts to increase the number of students in the M.Eng. program. The number of enrolled students shows a slight increase this academic year.

UNENE program changes are in progress with the objective to reduce the cost of the courses, increase the duration of each course from 3 to 4 months (and the total program from 2 to 3.5 years), increase flexibility of course location (to be close to organizations with the largest number of students registered in a course), and increase the number of courses given at the training level.

The UNENE program continues with three projects with the IAEA, one aimed to prepare a course with distance-education using electronic tools, the other one to convert selected chapters of the CANDU Textbook into an e-Module platform, and the third to consider offering IAEA-sponsored Master of Safety and Security at the McMaster and UOIT.

2. General Update and Enrolment Trends

The total enrolment since the start of the UNENE M.Eng. Program is 133 students, 111 of them graduated in previous years, and 4 graduate this year. Currently there are 18 active students, and in addition there are a couple of applications for admission being processed. Figure 1 shows the current enrolment status in the UNENE M.Eng. program.

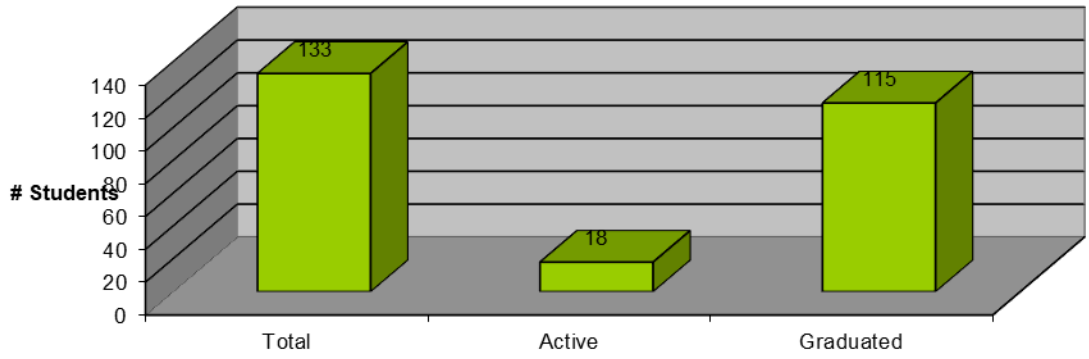

Figure 1: Enrolment in the UNENE M.Eng. Program

The UNENE management is making further efforts to promote the program at the Canadian industry organizations. However, due to the fact that several students graduated in this year, the total number of students is still relativelly low. Considering further activities in performing program changes, it is expected that the number of students may further increase in the following year.

Figure 2 shows the enrolment status in the UNENE Diploma Program. The number of students in the Diploma program is reduced by one student compared to the previous reporting period due to a recent transfer.

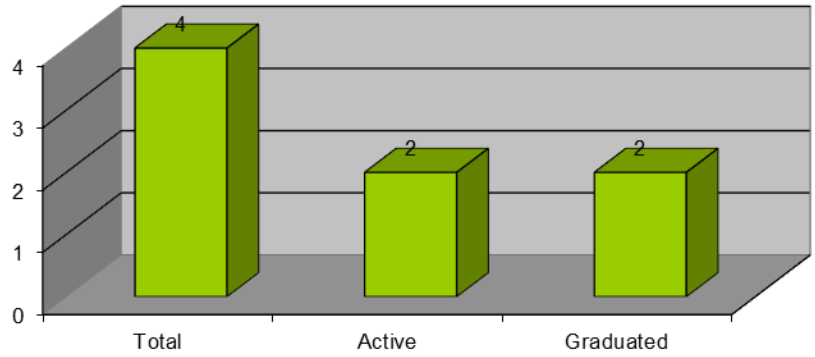

Figure 2: Enrolment in the UNENE Diploma Program

The M.Eng. enrolment trend is shown in Figure 3. A period of decline of students was observed in the period 2011-2017. However, during the 2017-18 academic year a positive trend is observed, as new students were admitted to the M.Eng. program.

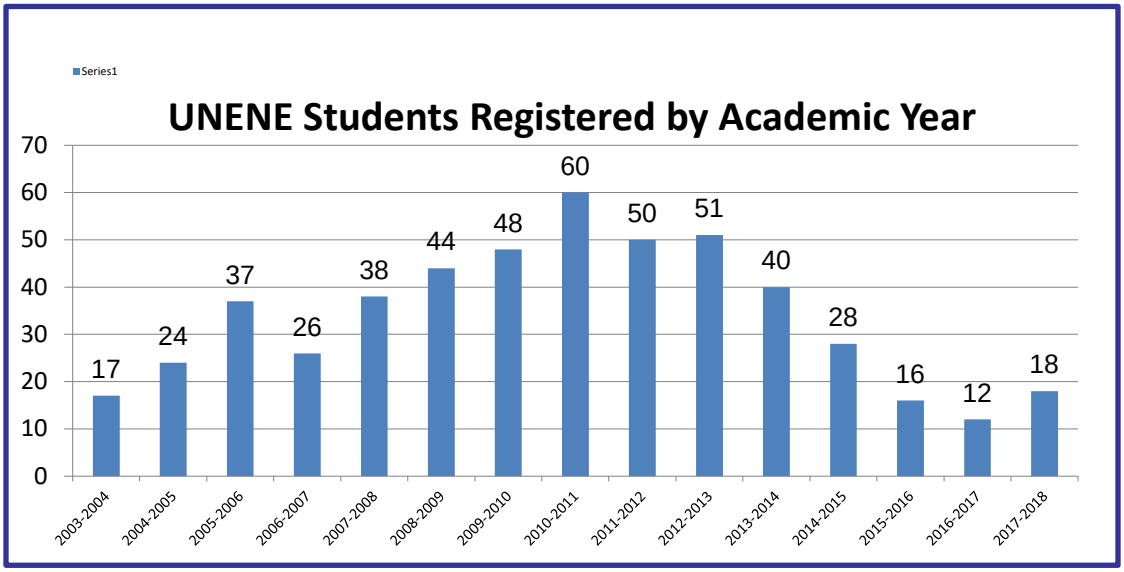

Figure 3: Number of UNENE M.Eng. Students Registered by Academic Year

It is expected that by continuing to implement the program changes and modifications, the number of students will continue to follow this positive trend.

UNENE management prepared a proposal for program modifications to address student low enrolment. A plan for addressing the low enrolment is further discussed in this report, and details were provided in a separate document that was originally submitted to the Board at the meeting in Sep 2017 and revised for this Board meeting.

3. Revised Course Schedule

Figure 4 shows the revised course schedule from Aug 2018 until Jul 2021. The purpose of this revision was to accommodate the core courses to be given every second year. This is needed because all students, including the new students, need to be given the opportunity to take the core courses as quickly as possible.

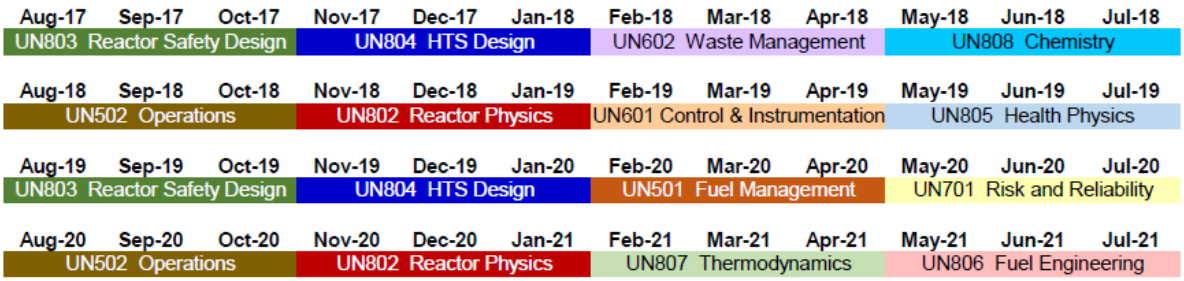

Figure 4: Revised Course Schedule 2018-2021

4. Graduate Courses in the 2018-2019 Academic Year

The academic schedule in this academic year follows the schedule for this UNENE new cycle that started in August 2017.

The following graduate courses have been completed in 2017-18 academic year:

i. UN 0803 – Safety Design / Victor Snell, Aug-Oct 2017,
3 students enrolled, three students registered, classroom teaching.

ii. UN 0805 – Introduction to Operational Health Physics / Dave Tucker.
Course given to Bruce Power, at BP site, 4 students, December 2017.
Course held in one full week, classroom teaching.

iii. UN 0804 – Reactor Heat Transport System Design / Nik Popov, Nov 2017–Jan 2018, 8 students registered, 2 withdrawn, 6 completed the course; classroom teaching.

iv. UN 0602 – Waste Management and Decommissioning / Western University, Feb–Apr 2018, 13 students registered and completed the course; classroom teaching.

v. UN 0808 – Chemistry Course / instructors Derek Lister and Willy Cook from UNB; May-Jul 2018; 8 students registered, 4 university students from Ontario registered, and 9 students from New Brunswick were registered through UNB.

The following graduate courses are scheduled this year:

i. UN 502 – Operations / instructor Glenn Harvel and Adam Lipchitz, Aug-Oct 2018.

ii. UN 802 - Reactor Physics / Instructors Ben Rouben and Eleodor Nichita, Nov 2018 – Jan 2019.

iii. UN 601 – Instrumentation and Control / Instructor J. Jang from Western University, Feb-Apr 2019.

iv. UN 805 – Health Physics / Instructor to be selected or hired at McMaster University, May-July 2019.

5. Training Courses

a. Project Management Training Course

As per agreement with OPG training office, UNENE is contracted to deliver 4 Project Management (PM) sessions for classes with about 15-20 students in each session as per a 2-year contract (July 2017- June 2019). Several sessions were delivered in 2017 and 2018, and other course sessions are planned in 2018.

The PM courses are provided by Mrs. Darya Duma, from Procept Associates Ltd., which is on contract to UNENE for these courses. Each PM training course is given over 5 days in one week. This course is considered as a training course, so students who complete this course are issued certificates, not a graduate credit.

The UNENE management will offer this version of the PM course to other industry partners as a training course. However, the M.Eng. version of this course will be retained in the UNENE program and will be made available to students who are enrolled in the M. Eng. program.

b. Other Training Courses

Following this pilot training course other courses will be organized by UNENE for various nuclear industry organizations in Canada.

The Program Director will continue to collect feedback from industry organizations on the needs and expectations in the training area. So far initial discussions were held with Kinectrics, Candu Energy, and CNSC. Some of the common issues that require further discussions are:

- Making significant changes to the current M.Eng. courses will require funding and instructor time.
- Industry organizations need to provide continuing support in terms of number of students to register.
- Different expectations and needs by different organizations may be difficult to combine and envelope in a particular training course.

The Program Director will discuss with course instructors the estimate of the scope, cost and schedule of the work required to modify the courses into training courses.

6. Program Issues

The primary objective for the program changes is to address the relatively small number of registered students in the M.Eng. program. Details of the Program Changes were provided to the Board in September 2017 in a separate document, which was also resubmitted to the Board with a few minor changes at the meeting in January 2018.

6.1. Program changes

Implementation of UNENE graduate programs changes is in progress:

- <u>Flexible lecturing location</u>
  The course location is flexible and can be chosen to be close to the industry participants, i.e., their employees. Future lecture locations can include the Bruce site for BP employees, Chalk River site for CNL employees, Ottawa for CNSC employees, and other locations close to other industry partners, based on the number of registered students.
- <u>Training courses</u>
  UNENE program content and format will be adjusted to address specific needs of the industry for providing UNENE training courses.

- UNENE training E-Modules
  In addition to the classroom-type training sessions, also E-Modules will be developed to allow students to access training material remotely, and without instructor being available in person in the classroom.

6.2. Communication with stakeholders

Communication meetings are being conducted with industry management and employees so that UNENE can get a better understanding of the industry needs and expectations, and, at the same time, the industry management and employees can get a better awareness of the UNENE program possibilities and benefits. To achieve this objective, the following activities will be conducted:

- Discussions with industry senior management to identify ways for improving the courses content and format to better meet industry expectations and needs.
- Organize awareness presentations to industry employees with the objective to promote and explain the UNENE possibilities and benefits to the industry.
- Prepare program changes such that the courses having a small number of students (less than 4) be delivered in a self-study (reading) format.
- Offer UNENE graduate courses in single-course format for graduate credit.
- Offer UNENE courses as training courses that will not be credited for a graduate degree. This activity will require financial support by UNENE to convert the currently existing graduate courses into training-level courses.

6.3. Courses with Small Number of Students

As per decision by the Board at the last meeting, in situations when the number of students is below 4, the UNENE courses will be given as reading courses. In this case, no classroom teaching will be performed, and in which the instructors will receive 50% of the remuneration for in-class course delivery.

Program Director will inform the 5 universities that enroll students in the M.Eng. on the academic and financial consequences resulting from activating a course as a reading course. Program Director already discussed the academic aspects of the reading courses with the Graduate Studies at the McMaster university, and obtained agreement in principle.

6.4. University Students Enrollment

An increased interest of university graduate students was observed recently for the Chemistry Course UN808 (13 university graduate students requested to be registered, one from Waterloo, 3 from Guelph, and 9 from UNB). These students submitted a registration request to McMaster University. The Graduate Studies accepted the students from Ontario by using the OVGS forms. However, the out-of-province students could not be registered this way, and they participated in the course through their home university.

UNENE will continue to accept regular graduate students from Ontario universities using the OVGS process. These students normally do not pay for the course, as this is considered a regular student exchange between Ontario universities.

Program Director will inform interested out-of-province universities that the only way they can have their students register is by including UNENE courses in their academic calendars. This will apply only to the universities that are members of UNENE.

7. New Courses

Two new courses are being prepared to be started:

i. UN503, Nuclear Energy in Society: Regulation and Energy Future.
This course was approved a couple of years ago, and was assigned to UOIT, but no instructor has been assigned for this course, and no course content has been clearly defined. Program Director initiated discussion with UOIT about this course and suggested that Dr. Victor Snell and Dr. Nik Popov prepare the course content.

ii. UN504, Nuclear Power Systems and SMRs
This course is based on the UOIT undergraduate course ENGR 4460U, given by Prof. Igor Pioro. Igor prepared a modified version of the course syllabus and is being reviewed by the Nuclear Department at UOIT. UNENE will take further steps after UPIT completes the process of course review and approval.

8. Cooperation with the IAEA

a) Pilot Project - UNENE Blended Education

The objective of this cooperation with the IAEA is to prepare and test a course delivery using the distance-education method.

This will help evaluate possibilities for development of other training courses that can be given classroom or using electronic tools. This is part of the UNENE strategy for expanding the education business beyond the graduate university driven courses.

This project was started under the UNENE-IAEA agreement signed in 2016, and is now continuing under the renewed agreement for cooperation between UNENE and the Nuclear Knowledge Management Section at the IAEA.

The UNENE management identified 4 instructors: Ben Rouben for CANDU characteristics (3 hours), Eleodor Nichita for physics (5 hours), Nik Popov for thermalhydraulics (5 hours), and Victor Snell for safety (5 hours). The total number of teaching hours is 18 (3 days). These experts will prepare the pilot course material and will deliver the course.

The experts involved in delivery of this pilot course proposed to receive UNENE financial support of $500.00 per hour of course delivery, which is standard cost for technical lectures delivery.

An agreement was reached with Prof. Daniel Dupleac from the Polytechnic University in Bucharest, Romania, to deliver the pilot distance-education course to a group of Romanian students. The course will given using the UOIT video teaching room and equipment, and it will be delivered remotely to Romania in May 2019, when the UOIT video teaching room is less busy. Program Director needs to complete discussion with UOIT on possible cost for using the video teaching room and technical assistant for this purpose.

b) CANDU Textbook in E-Learning Modules

Recently the IAEA staff in the Nuclear Knowledge Management section obtained an electronic copy of the CANDU Textbook “The Essential CANDU”. The IAEA provided a positive opinion on the textbook content and quality. They proposed that the textbook be converted into e-Learning modules at IAEA online platform and be offered internationally as a training material.

To demonstrate the practicality and usefulness of converting the textbook chapters into e-Learning modules, the IAEA staff prepared a draft e-Learning module of the chapter covering the CANDU systems. This chapter is available to the UNENE Program Director for review and feedback.

The IAEA organized and funded a meeting at the IAEA in Vienna at the beginning of February 2018, at which further work was performed by the UNENE Program Director, and Prof. Daniel Dupleac from Romania in terms of improving and cleaning up the draft

E-Module on CANDU Systems prepared by the IAEA. The trip report regarding this meeting is prepared under Board meeting action 54.2.

Since the cost of the IAEA work on the remaining Textbook chapters was relatively high, it was decided to perform transfer of several selected chapters into E-Modules by the chapter authors. The E-Modules completed in this way will be at the entry level but will demonstrate the usefulness and practicality of the Textbook E-Modules. Based on this pilot project outcomes, decisions will be made on further improvements and commercialization of the E-Modules use by Canadian and international organizations. The E-modules will demonstrate to UNENE if the E-modules could be used for remote training of Canadian and international nuclear staff.

Two meetings were held at COG, at which this project was discussed. COG support was provided by John Sowagi and Fred Dermarkar. Also, COG agreed to fund this project with the budget allocated for CANDU Textbook Maintenance. COG funding will be provided for 2018-19 and 2019-20, each year $7,500 (50% of this is UNENE shared funds). Contract with the chapter authors will be issued by COG, and the project progress will be monitored by COG. The project lead will be Bill Garland, who was the lead of the CANDU Textbook preparation work. UNENE will use a small additional budget for hiring students to assist chapter authors.

c) IAEA Master of Safety and Security Graduate Programme Development

Nik Popov was invited by the IAEA to be a member of a team of university professors that were given the task to develop the curriculum and syllabuses for Master of Safety and Security graduate program. The project started in May 2018 and is expected to end by March 2019.

As part of this work, Nik Popov maintains continuous contact with McMaster and UNENE professors with the objective to get their feedback on the gradate curriculum being developed, and also on the possibility to have the first pilot 12-month program tested in cooperation by McMaster and UOIT under the UNENE management. Preliminary agreement was obtained from McMaster and UOIT professors to continue discussions with the IAEA on this possibility.

At this time, this information is provided to the Board for awareness of this possibility.