UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY

Brief for the Appraisal
of the MASc and MEng in
Nuclear Engineering

Submission for the Academic Council

May, 2007

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1 INTRODUCTION

1.1.1 Brief listing of programs

The University of Ontario Institute of Technology (UOIT) proposes to offer a graduate program leading to the degree of Master of Applied Science and Master of Engineering in Nclear Engineering. There are two fields in the program: nuclear power and radiological and health physics. The MASc program has a strong research focus and will consist of courses and a thesis. The MEng program emphasizes course-based learning and has two options: the MEng-Course consists entirely of courses, while MEng-Project has courses and a project. In all options there is an emphasis on the development of research skills and on the presentation of research results. While the MEng-Course option does not require a major research report, research projects will be undertaken in a number of the graduate courses.

The program is planned to be launched in the 2007-08 academic year, as soon as practical after all necessary approvals are obtained.

1.1.2 Background

The University of Ontario Institute of Technology is Ontario's newest university. UOIT accepted its first undergraduate students in the fall of 2003.

The School of Energy Systems and Nuclear Science offered its first undergraduate program in Nuclear Engineering in the fall of 2003. At the same time an undergraduate program in Radiation Science was also initiated. With the rapid growth and success of the undergraduate nuclear engineering and nuclear science programs at UOIT, the School of Energy Systems and Nuclear Science is ready and able to expand into graduate programs by offering MASc and MEng programs.

There are currently no graduate level programs offered by the School of Energy Systems and Nuclear Science. UOIT's Faculty of Engineering and Applied Science has received approval from the Ontario Council of Graduate Studies (OCGS) and Ministerial Consent to offer Master's level programs in Mechanical Engineering and Electrical and Computer Engineering. A number of Energy Systems and Nuclear Science faculty will contribute to these programs. Faculty members from the School of Energy Systems and Nuclear Science will also participate in the MSc program in Modelling and Computational Science offered by UOIT's Faculty of Science.

1.1.3 Graduate Program Demand

The Ontario Council of Graduate Studies (OCGS) has stated that the need for graduate education in Ontario will double in the near future. One of the drivers is the so-called "Double Cohort" of undergraduate students, who will graduate in 2007. The demand for graduates in the area of the proposed program is expected to be particularly high in the industrial, public service and health care sectors.

The industrial jobs are expected to be mainly, but not exclusively, within the nuclear industry. Worldwide, and certainly within the province of Ontario, there is a growing realization that nuclear energy will be an important aspect of any national strategy for emissions control and climate-

change mitigation; therefore, some expansion of nuclear power for electricity production is inevitable. At the same time, the demographics of the major players in Canada's nuclear industry indicate a huge exit of experience from the work force through retirements over the next two decades. These jobs require individuals with a sound understanding of the engineering principles that govern the safe and reliable operation of nuclear power plants and supporting facilities.

Nuclear engineering practice is at the intersection of a number of different disciplines, and professionals in this industry need to work closely with engineers, scientists, business and information system specialists who perform a number of different, but interrelated tasks. Problem-solving skills and the ability to communicate and work with people from a variety of disciplines will be critical. The graduates of the proposed MASc and MEng in Nuclear Engineering will be well prepared to fill these positions and to contribute to the province's and the country's economy. Students will study a broad spectrum of engineering design and analysis techniques applicable to nuclear power plant design, operation, maintenance and decommissioning, as well as the underlying principles that govern the interactions of radiation with matter, the behavior of radioactive materials in the environment, radiation dosimetry and the biological effects of radiation on humans and non-human biota. In addition, the program offers courses and research opportunities in advanced computational techniques such as Monte-Carlo simulation and modeling, in medical applications such as imaging, radiotherapy and diagnosis through the use of radioisotope imaging and in industrial applications of material processing and non-destructive testing. This broad range of advanced education will be achieved through the variety of courses offered, including a seminar course, and via research interactions between students and faculty involved in the program. Furthermore, because the smallest academic units at UOIT are the Faculties (i.e., there are no divisions at the departmental level), interaction between specialists of many disciplines is enhanced. These interdisciplinary interactions will provide the experience for graduates of the program to contribute effectively in an interdisciplinary group in any work environment.

We expect that the number of qualified applicants for the program will be greater than the number of students that the faculty will be able to support. In general, this is typically true for graduate programs in engineering; however, we expect that there will be a particularly strong demand for the proposed program. In 2007, the first undergraduate classes will graduate from the School of Energy Systems and Nuclear Science, the Faculty of Engineering and Applied Science and the Faculty of Science at UOIT, and it is anticipated that many of these students will want to pursue graduate studies. As noted previously, in this same year, Ontario students involved in the double cohort will be graduating. This will create a very significant increase in demand for graduate programs across the province. Furthermore, the OCGS expects that the increased demand will not be limited to the graduating year of the double cohort but, due to the changing needs of our workforce, demand will continue to increase in general. Such growth is particularly true for the nuclear industry where staff replacement rates alone generate a large need for Highly Qualified Personnel. As a result of recent applications by both Ontario Power Generation (OPG) and Bruce Power to the Canadian Nuclear Safety Commission (CNSC) to proceed with the construction of new nuclear-electric generating units, it is expected that the demand for graduate programs in nuclear engineering will be even greater. Among Canadian universities, UOIT's School of Energy Systems and Nuclear Science already has the largest complement of nuclear engineers and scientists in its core faculty. The approval of the proposed graduate program in nuclear engineering and the opportunities this brings for research chairs will contribute to further growth of expertise in a field that is critical to the economic well-being of Ontario.

Once it receives approval from the provincial authorities, the UOIT Master's program in Nuclear Engineering will be one of the key graduate programs offered in this field in Ontario. The location of UOIT in close proximity to the Pickering and Darlington nuclear power plants and to OPG's nuclear

head office will result in these programs being in particularly high demand, especially for employees wanting to earn a master's degree via part-time studies. The program is also expected to draw part-time applicants from Bruce Power, Atomic Energy of Canada Limited (AECL), Nuclear Safety Solutions (NSS), Cameco, the Canadian Nuclear Safety Commission (CNSC) and a number of nuclear service companies. UOIT's proposed program in Nuclear Engineering is unique in offering a wide range of integrated specialties with focus on applications to energy, health care, education and public safety.

The University Network of Excellence in Nuclear Engineering (UNENE) was established in recognition of the need to significantly increase the number of graduate degree holders in nuclear engineering in the Ontario. As a result of this initiative, five research chairs have already been established with a focus on nuclear engineering research. UOIT's proposed MASc will be the first master's program in Ontario to award the MASc degree in Nuclear Engineering. OCGS has already approved the course-based MEng in Nuclear Engineering jointly offered by McMaster, Waterloo and Western (with support from and applications pending from Queen's and Toronto), and UOIT's proposed MEng will include all the elements of the UNENE sponsored MEng in Nuclear Engineering. If approved, UOIT will be the only Canadian university to have the in-house capability to offer the complete MEng in Nuclear Engineering program. Since its inception in 2004, 16 students have graduated from the UNENE sponsored MEng program, and there are currently 40 students in various stages of the program. Since the majority of the students are from the OPG facilities located in Durham Region, most of the courses have been offered at UOIT and Durham College and faculty members of UOIT's School of Energy Systems and Nuclear Science have taught a number of the courses in the UNENE program.

1.2 Program Overview and Objectives

The proposed Nuclear Engineering graduate program encompasses many aspects of the nuclear power industry, from fuel manufacture to radioactive waste disposal and the many and varied applications of radiation in industrial and medical disciplines, with a strong emphasis on health physics. Typical workplace activities include: fundamental and applied research, design and development of new equipment; systems and procedures; maintenance and modifications; commissioning and decommissioning of equipment and complete facilities; operation, analysis and regulatory affairs. The graduate of a master's program 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 proposed program provides the depth and breadth of knowledge necessary for a practicing professional in nuclear engineering. Under the guidance of a thesis supervisor and a multi-disciplinary team of scientific and engineering faculty , each student will have the opportunity to engage in in-depth study of particular problems that emphasize theory and/or experiments.

The Nuclear Engineering Program will:

1. Provide an interdisciplinary perspective on nuclear engineering with a focus on the safe and reliable applications of nuclear and other radiation technologies

2. Engage students in hands-on, basic and applied research in nuclear science and engineering

3. Provide students with a set of engineering skills to permit them to continue on in an academic environment or in one of the many available industrial or institutional settings

4. Provide students with technical communications skills, enabling them to function in a team environment that includes personnel with a range of backgrounds

The objective of the MASc program is to prepare students for a career as engineers in fields that require specialized knowledge and skills. It is expected that graduates of the program will be able to work as engineers in industry, companies and government agencies with strong R&D programs, or to continue in their education and pursue a doctorate degree at institutions of higher learning around the world. The objective of the MASc program is achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

The objective of the MEng program is to provide a specialist post-graduate program for engineers and scientists, whether recent graduates or practicing professionals with industry experience, to develop and/or upgrade and expand their knowledge in aspects of nuclear engineering. Graduates of the program will be able to use what they have learned in a variety of applications in industry, government and academia. The objective of the MEng program is achieved through either a combination of course work and a project or solely course work, depending on which option the student selects. All MEng students will be required to engage in research activities as part of projects in many of the courses.

1.3 Method used for the Self-study

This brief was prepared by a graduate committee, consisting of core faculty of UOIT's School of Energy Systems and Nuclear Science. Input from industry professionals and academics at other institutions was sought. The brief has been reviewed by the joint Curriculum Committee and the joint Faculty Council of the Faculty of Engineering and Applied Science and the affiliated School of Energy Systems and Nuclear Science, as well as by the Dean of Graduate Studies, the Graduate Studies Committee and the Academic Council of UOIT.

Graduate Committee Members of the School of Energy Systems and Nuclear Science:

Dr. George Bereznai (Dean of the School of Energy Systems and Nuclear Science)
Dr. Glenn Harvel
Dr. Brian Ikeda
Dr. Lixuan Lu
Dr. Eleodor Nichita
Dr. Igor Pioro
Dr. Anthony Waker
Dr. Edward Waller

1.4 Fields in the Program

The master's program is comprised of the following fields:

- Nuclear Power
- Radiological and Health Physics

1.5 Review Concerns Expressed in Previous Appraisal and Actions Taken

As this is an application for a new program, this section is not applicable.

1.6 Special Matters and Innovative Features

UOIT's Interdisciplinary Environment

The University of Ontario Institute of Technology is in a unique position to offer a program in Nuclear Engineering. By its nature, Nuclear Engineering is a broad interdisciplinary field, and any associated program requires core faculty members with diverse scientific backgrounds, experience and research which is of an interdisciplinary nature. The core faculty of the proposed MASc and MEng in Nuclear Engineering satisfy this requirement. The Faculties at UOIT are themselves single interdisciplinary units; this fosters interdisciplinary collaboration across all disciplines. Furthermore, the strategic research plan of UOIT highlights interdisciplinary research as an area of importance, and the participating Faculties are committed to building on their strengths to achieve this goal.

The following are examples of UOIT's potential for interdisciplinary collaboration:

- **A Tier 1 Canada Research Chair in Aquatic Toxicology**, whose research focuses on the biological impacts of water and food-borne toxicants on aquatic organisms, has established a state-of-the-art aquatic toxicology laboratory at UOIT. His program involves the determination of the relative importance of pulse exposure versus continuous exposures in understanding how toxicants affect the ability of aquatic organisms to grow, reproduce and survive. This research program incorporates methodologies and addresses issues which are similar to those involving radiological aspects of nuclear power and environmental protection. This provides an obvious opportunity for synergistic collaboration between researchers from different Faculties and disciplines. For example, a researcher in the proposed MASc/MEng program may choose to conduct research into the assessment of nuclear power plant emissions on non-human biota and environmental radiation protection. The importance of this research is elaborated further in the following paragraph.

- **Environmental Impacts of the Nuclear Fuel Cycle:** Under routine conditions, a nuclear reactor releases small quantities of radionuclides into the environment. Likewise, in the unlikely event of a reactor accident, releases will also happen. To determine potential impact on human and non-human biota, it is important to understand the fundamental mechanisms of transport of radionuclide species. Current international guidelines are explicitly considering non-human biota, as part of a comprehensive protection strategy. Research into plant source term modeling, escape from containment, distribution into plant environs, and dispersion into the global environmental is conducted using novel dosimeters, air sampling and aerosol characterization and analysis of receptors. The Amber, GoldSim, ResRad and FLUENT computer codes are used to assist in understanding the transport processes. Emphasis is given to understanding H-3 and C-14 environmental transport.

- **Imaging of Visually Obscured Objects:** There are many instances when an image of an object is required when it is visually obscured from sight. Examples include human targets behind walls, pipes buried in walls, or any other structure inside a structure

where access to only a single side is possible. Because of the low efficiency of the scattering process compared to transmission, a detailed real-time image is only possible by using specialized techniques. Research is being conducted on a technique known as coded aperture imaging; this is being applied to a one-sided x-ray imaging system.

- **Advanced Control:** New control techniques have evolved over the last few decades. Distributed control and networked control have been successfully adopted in other industries such as the automobile industry and building automation, and there is significant expertise in these areas in the Faculty of Engineering and Applied Science. More recently, industrial-standard wireless control technologies have become available, offering enhanced flexibility and reliability. Teams of experts will investigate the applicability of these advanced control techniques for process control in nuclear power plants. In a related area of research, reliability and safety assessments on the design of the digital control systems in nuclear power plants are performed using the risk-informed techniques.

Membership in UNENE

The University Network of Excellence in Nuclear Engineering (UNENE) is a consortium of academic, industrial and government agencies mandated to increasing the availability of Highly Qualified Personnel in various areas of scientific and engineering research relevant to the sustainability of the nuclear industry in Canada. UNENE was established to meet the needs of Canada's nuclear industry to develop highly educated and specialized personnel and, in particular, to increase the professional skills of its current employees. Many of the major nuclear organizations in Canada, including Ontario Power Generation (OPG), Bruce Power, Atomic Energy of Canada Ltd (AECL), the CANDU Owners Group (COG) and the Canadian Nuclear Safety Commission (CNSC) strongly support the UNENE initiative. There are currently NSERC-UNENE Industrial Research Chairs in the following areas:

- Nuclear Safety Analyses and Thermal Hydraulics
- Advanced Nuclear Materials
- Nano-Engineering of Alloys
- Risk-based Life Cycle Management
- Control, Instrumentation and Electrical Systems

UOIT is a member of UNENE and holds the candidature for an NSERC-UNENE Industrial Research Chair in Health Physics and Environmental Safety. Membership in UNENE provides UOIT with direct access to industrial, academic and government partners involved in radiological health. This enables faculty and students to acquire detailed knowledge of the latest innovations and the most current issues concerning radiological safety. UOIT is uniquely positioned to ensure its graduate program and research efforts are timely, relevant and responsive to the province's needs.

The following are examples of research capability at UOIT that will strengthen UNENE and leverage the collaborations promoted by participating in coordinated research conducted with UNENE support.

- **Health Physics and Environmental Safety** is the research area for the Chair at UOIT. The principal aim of this research is to minimize the radiation hazards to workers, the general public and non-human biota that may result from the operation of nuclear power plants and related facilities. The scope of the research ranges from measuring, modelling and mapping present and expected radiation fields inside nuclear power plants and in areas extending out from the power plant into urban and rural areas. Such research will incorporate the following elements: development of innovative devices to measure radiation fields in designated localities in real time; computer modeling of radiation fields; risk assessment of the impact of radiation released as a result of nuclear power plant operations on human and non-human biota; and the development of an on-line health physics and environmental protection information management system.

- **Neutronics Modelling:** Research is ongoing to improve the accuracy of the neutron-flux and power calculations for static as well as dynamic nuclear reactor behaviour. The objective is to develop methods for calculating the detailed, fuel-pin-level, neutron flux and power distribution in a nuclear reactor at an acceptable computational cost. Several approaches are being considered, including global-local iterations and heterogeneous finite elements. For each of these approaches, parallel, high-performance computing implementations are also being investigated. Methods of combining calculation results with detector measurements for a more accurate determination of the neutron flux are also being pursued. There are a number of opportunities for cooperation between this research and the work done under the McMaster University chair and associate chair in Nuclear Safety Analyses and Thermal Hydraulics.

- **Multiphysics Reactor Simulation:** Given the advances in computing power, there is increased interest in the nuclear industry for detailed simulation of reactor behaviour through coupled neutronics, thermalhydraulics and radiation field calculations. To date, each of these areas has been developed independently and models and data representations are not always compatible. Research in this field is focused on establishing a common framework to allow communication and data exchange between the three models and on modifying each of the individual models to ensure compatibility with the others. The opportunity exists for UOIT researchers to combine their efforts with those of colleagues at McMaster and at Waterloo to significantly improve the simulation models available to support design, safety analysis, commissioning and operations.

- **Nuclear Fuel:** Funding of the Cameco Research Chair in Nuclear Fuel ($1.5M over five years) was announced on April 12, 2007. The Chair Professor, Dr. Brian Ikeda of UOIT's School of Energy Systems and Nuclear Science, will lead a team to study the physical and chemical processes affecting the production of nuclear fuel, in particular the corrosive processes in the electrochemical cells that produce Uranium Hexafluoride (UF_6). UNENE is already supporting research into aspects of nuclear fuel at the Royal Military College that are significantly different from the work planned at UOIT. Regular meetings between the two groups will ensure that the respective research is complementary.

There is only one other Master of Engineering (MEng) program in Nuclear Engineering available in Ontario. It is offered jointly through Waterloo, Western and McMaster Universities and sponsored by UNENE. This program is offered on a part-time basis at various locations in the province to professionals working in the nuclear industry. Students are required to complete ten courses to earn the MEng degree. Several of UOIT's faculty members in the SESNS teach

courses in this program. Since the UNENE sponsored program's inception in 2004, 16 students have graduated with MEng degrees, and there are currently 40 students in various stages of the program. Since the majority of the students currently enrolled in the program work at OPG facilities located in Durham Region, most of the courses have been offered at UOIT and Durham College campuses.

The proposed UOIT program has been designed to include courses comparable to all of the courses in the Waterloo, Western and McMaster MEng program. This curriculum has already been reviewed by external consultants and approved by OCGS as well as sanctioned by industry representatives and employers. UOIT supplements these offerings with a range of additional courses from which students may design courses of study relevant to their backgrounds and interests. Once its program is approved, UOIT will be the first Ontario university to offer a MASc degree in Nuclear Engineering to full- and part-time students. It will also be the only Canadian university to have the in-house capability to offer the complete MEng in Nuclear Engineering program. In accordance with the University's residency requirement, students may be awarded transfer credits for up to half of the requirements of a graduate degree. (See Section 13 of the General Policies and Procedures for Graduate Studies at the University of Ontario Institute of Technology in Appendix B.) This will allow students currently enrolled in the UNENE sponsored program and living and/or working in Durham Region to complete the requirements for their MEng in Nuclear Engineering at a consistent and convenient location.

Industry Experience of the School's Faculty

As a result of the unique combination of UOIT's mandate to be "market driven" and the lack of nuclear engineering degree programs at Canadian universities, most of the faculty members joining the Nuclear Engineering program have strong industrial backgrounds. The following table summarizes this industry experience:

Name	Former company	Years of experience
Bereznai, George – Professor	Ontario Power Generation	30
Harvel, Glenn – Associate Professor	Atomic Energy of Canada Ltd	11
Ikeda, Brian – Associate Professor	Atomic Energy of Canada Ltd	25
Nichita, Eleodor – Assistant Professor	Atomic Energy of Canada Ltd	6
Pioro, Igor – Associate Professor	Atomic Energy of Canada Ltd Institute of Thermal Physics, Kiev	6 13
Waker, Anthony – Professor	Atomic Energy of Canada Ltd	13
Waller, Edward – Associate Professor	Science Applications International Corporation	15

Naturally, UOIT will continue to capitalize on these existing relationships, as well as initiating new collaborations. Arrangements have been made to share ideas, projects, software tools, equipment, and laboratories in order to augment the resources available to faculty and students on the UOIT campus.

Computing Resources (SHARCNET)

UOIT is a member of SHARCNET (Shared Hierarchical Academic Research Computer Network (http://www.sharcnet.ca), a high-performance computing consortium of 9 universities and 2 colleges

based in South-Central Ontario. A high-speed optical network connects the computing facilities located at each institution. At present, the majority of the computational facilities are located at McMaster University, the University of Western Ontario and the University of Guelph; however, UOIT faculty and their research groups have access to any part of this state-of-the-art computing facility. SHARCNET was successful in a recent 2004 CFI Innovation Fund competition ($48.3M), which will result in a significant expansion of the facility. With the new funding, it is projected that SHARCNET will become one of the top 100 High-Performance Computing facilities in the world. As part of this expansion, UOIT will acquire a small 'development cluster' of approximately 32 processors that will be located on-site. This, combined with other local equipment, will give students involved with computational problems in nuclear engineering the ability to work with state-of-the-art computing infrastructure.

Unique Nuclear Research Facilities

The School of Energy Systems and Nuclear Science has various laboratories available to support graduate studies coursework and research. The simulation lab contains a state-of-the-art computer and display system for simulation of nuclear power plants, such as the Pickering and Darlington nuclear-electric generating units, and the School has the capability to develop software for advanced reactor designs.

A state-of-the-art aerosol research laboratory (Room UAB 408) is used to investigate potential hazards from terrorist use of radiological dispersal devices (RDDs). The research is widely applicable to determination of hazards from airborne radioactive contaminants.

The existing two-phase flow lab in UA 1420 will support thermalhydraulic experiments in fundamental phenomena applicable to CANDU, MAPLE, PWR, and BWR type nuclear reactors. The laboratory currently contains the following equipment:

- A vertical annulus test section for two-phase flow representing steam generators and PWR/BWR technology.
- An Electrohydrodynamic (EHD) Test Section for the study of electric forces on fluid flow and heat transfer. (Applicable to EHD type heat exchangers and condensers).

An additional laboratory (Simcoe Building 1006) is now available and will be upgraded over the summer for larger scale thermalhydraulic equipment and nuclear physical processes. This laboratory will contain a full length/full scale CANDU fuel channel complete with mock fuel bundles, a MAPLE nuclear reactor fuel channel, a $1/8^{th}$ scale steam generator and other test loops. Combined, these test facilities will allow for the study of two-phase flow phenomena in a variety of nuclear technology applications.

Both the two-phase flow laboratory and the nuclear physical processes laboratory will be supported by various instrumentation, including:

- A high speed ultrasonic system for measurement of two-phase flow parameters.
- A Capacitance based system for measurement of two-phase flow parameters.
- Computers and Associated Thermalhydraulic Codes for Numerical Analysis

Future plans include the expansion of this facility into a Nuclear Design Laboratory. This will support the study of advanced reactor concepts such as generation IV technology and integrated research programs combining nuclear design, thermalhydraulics, radiation, materials, and chemistry. Nuclear Thermalhydraulics is a limiting category in design optimization, life performance, and safety margins

for Nuclear Reactors and Nuclear Power Plants. The construction of this dedicated space will enable faculty and students to pursue significant research and development in the following important areas:

- Mechanistic Modelling of Critical Heat Flux
- Applications in Waste Heat Utilization
- High Temperature Fluids including SuperCritical Fluids, fluid behaviour
- Development of Experimental Databases for Code Validation Purposes
- Study of unique geometries for design optimization: fuel bundles, feeder arrays, etc.

As an integral part of the School's proposed research program in Health Physics and Environmental Safety, specialized laboratories are being established for environmental radiation measurements and radiation detector development. The existing Environmental Radiation and Corrosion Lab, located in UA3680 of the Science Building, is equipped with a full range of counting equipment, including liquid scintillation counters and gamma spectrometry systems and fume-hoods for the handling and management of contaminated samples. A Radiation Detector Development Laboratory is being developed for the custom design, construction and testing of advanced gas ionization detectors used for radiation protection dosimetry such as low-pressure tissue equivalent proportional counters and gas electron multipliers. Coupled with these detectors are the electronic and computer facilities necessary for the development of advanced data acquisition systems and control software. This latter laboratory is expected to be functioning by the end of May 2007.

In addition to the existing and planned facilities on the UOIT campus, the School of Energy Systems and Nuclear Science has access to neutron beam port facilities at McMaster University and Materials and Chemistry labs at the Whiteshell Nuclear Research Establishment and at Cameco's Port Hope facility.

2 THE FACULTY

2.1 List of Faculty Members by Field

Table 1 lists the faculty members involved in the graduate program and identifies their research field, gender, home unit, and supervisory privileges. With the abolition of compulsory retirement in Ontario, prediction of faculty retirements has become highly uncertain, so only a few cases of probable retirements in the next seven years are noted in Table 1.

Although many of these professors are classified as Category 3 because they are involved in the teaching and supervision of previously developed UOIT graduate programs, there is a core group of nuclear scientists whose involvement will be primarily with the Nuclear Engineering Program. As members of the School of Energy Systems and Nuclear Science, their academic qualifications, experience and research interests are most closely aligned with the foci and fields of the proposed program.

This core faculty group includes:

Dr. George Bereznai – Professor and Dean of the School of Energy Systems and Nuclear Science
Dr. Glenn Harvel – Associate Professor
Dr. Brian Ikeda – Associate Professor
Dr. Eleodor Nichita – Assistant Professor
Dr. Igor Pioro – Associate Professor
Dr. Anthony Waker – Professor
Dr. Edward Waller – Associate Professor
Dr. Lixuan Lu – Assistant Professor

Table 1 on the following page lists 19 full-time faculty members and 7 part-time definite term complementary academic instructors, sessional lecturers and adjunct professors. Graduate faculty appointments, categories of graduate teaching and supervision privileges are described in Section 2 of the General Policies and Procedures for Graduate Studies at the UOIT (see Appendix B). Curricula Vitae for all faculty members listed in Table 1 are provided in Volume II of this submission.

UOIT is a new university which offered its first undergraduate programs in Nuclear Engineering in September 2003. The first undergraduate cohort will graduate in the spring of 2007. Many graduate students in the radiological and health physics field are likely to receive appointments as teaching assistants; this will certainly benefit the undergraduate program in Health Physics and Radiation Science.

Table 1: Faculty Members by Field

Faculty Name & Rank	M/F	Ret. Date	Home Unit [2]	Supervisory Privileges	Field 1[3]	Field 2[3]
Category 1						
Harvel, Glenn – Associate Professor	M		SESNS	Full	**X**	**X**
Pioro, Igor – Associate Professor	M		SESNS	Full	**X**	
Category 3						
Aruliah, Dhavide – Assistant Professor	M		FS	Co-supervision	**X**	**X**
Bartfay, Emma – Associate Professor	F		FHS	Co-supervision		**X**
Bartfay, Wally – Associate Professor	M		FHS	Co-supervision		**X**
Bereznai, George – Professor	M	2011	SESNS	Full	**X**	
Berg, Peter – Assistant Professor	M		FS	Co-supervision	**X**	
Buono, Pietro-Luciano – Assistant Professor	M		FS	Co-supervision	**X**	**X**
Dincer, Ibrahim – Professor	M		FEAS	Co-supervision	**X**	
Forbes, Shari – Assistant Professor			FS	Co-supervision		**X**
Gabriel, Kamiel – Professor	M		Associate Provost - Research	Co-supervision	**X**	
Green, Mark – Professor	M		FS	Co-supervision	**X**	
Green-Johnson, Julia – Assistant Professor	F		FS	Co-supervision		**X**
Holdway, Doug – Professor	M		FS	Co-supervision	**X**	**X**
Ikeda, Brian – Associate Professor	M		SESNS	Full	**X**	**X**
Jones-Taggart, Holly – Assistant Professor	F		FS	Co-supervision		**X**
Lewis, Greg – Assistant Professor	M		FS	Co-supervision	**X**	**X**
Lu, Lixuan – Assistant Professor	F		FEAS/SESNS	Full	**X**	
Marceau, Richard – Professor	M		Provost	Co-supervision	**X**	
Naterer, Greg – Professor	M		FEAS	Co-supervision	**X**	
Nichita, Eleodor – Assistant Professor	M		SESNS	Full		**X**
Nokleby, Scott – Assistant Professor	M		FEAS	Co-supervision	**X**	
Ren, Jing – Assistant Professor	M		FEAS	Co-supervision	**X**	
Rosen, Marc– Professor	M		FEAS	Co-supervision	**X**	
Waker, Anthony – Professor	M		SESNS	Full		**X**
Waller, Edward – Associate Professor	M		SESNS	Full	**X**	**X**
Category 4						
Bennett, Michael – Program Director	M		FEAS	Co-supervision	**X**	
Category 6						

Dymarski, Mike – Sessional Lecturer	M		SESNS	Co-supervision	**X**	
Ghafouri, Reza – Definite Term Complementary Academic Instructor	M		SESNS	Co-supervision	**X**	
Keshavarz, Ali – Definite Term Complementary Academic Instructor	M		SESNS	Co-supervision	**X**	
Meneley, Daniel – Adjunct Professor	M		SESNS	Co-supervision	**X**	
Neil, Barry – Definite Term Complementary Academic Instructor	M		SESNS	Co-supervision		**X**
Rouben, Benjamin – Adjunct Professor	M		SESNS	Co-supervision	**X**	
Schwanke, Peter – Sessional Lecturer	M		SESNS	Co-supervision	**X**	

Category 1: tenured or tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review. For this purpose the master's and doctoral streams of a program are considered as a single program. Membership in the graduate program, not the home unit, is the defining issue.

Category 2: non-tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review.

Category 3: tenured or tenure-track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.

Category 4: non-tenure track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.

Category 5: other core faculty: this category may include emeritus professors with supervisory privileges and persons appointed from government laboratories or industry as adjunct professors.

Category 6: non-core faculty members who participate in the teaching of graduate courses.

[2] FEAS: Faculty of Engineering and Applied Science
SESNS: School of Energy Systems and Nuclear Engineering
FS: Faculty of Science
FHS: Faculty of Health Sciences

[3] Field 1: Nuclear Power
Field 2: Radiological and Health Physics

2.1.2 New Faculty Requirements/Gaps to be Filled

At the present time, the only areas of study which cannot be adequately addressed by existing faculty are Nuclear Materials and Fuel Management. The School of Energy Systems and Nuclear Science has received administrative authorization to hire an additional core faculty member in this academic year. The position has been advertised and the School expects to hire a qualified professor with expertise in these targeted areas by July 2007, well in advance of the program start.

UOIT is open to offering adjunct professorships both to well-qualified external academics and to professionals with extensive industrial experience, who would contribute to the program in terms of student supervision and teaching of the graduate courses. UOIT's access to a large number of nuclear engineering professionals at OPG's facilities in Durham Region, as well as in the Greater Toronto Area, has already provided the School with an ample supply of adjunct faculty with extensive academic and industrial experience.

2.2 External Operating Research Funding

Table 2a presents the external research funding that faculty members have received to date since 2001. Note that the funding listed represents only confirmed funding and shall increase as the faculty members successfully secure additional funding. Since the first faculty member started at UOIT in 2003, the funding in Table 2a for the years 2001 to 2003 represents funding secured by UOIT faculty members while at other institutions.

Table 2a: Operating Research Funding by Source and Year

Year[1]	Granting Councils [2]	Other Peer Adjudicated [3]	Contracts	Others [4]
2001	603,691	781,459	76,249	387,162
2002	669,981	534,582	50,272	201,015
2003	477,981	975,999	105,625	210,000
2004	662,321	1,011,314	162,546	441,827
2005	702,146	392,233	202,046	386,067
2006	610,041	163,400	180,400	84,046
2007	331,341	674,500	103,600	110,00
Totals	4,057,502	4,533,487	880,738	1,820,117

2 NSERC, Atlantic Innovation Fund, Australia Research Council, CFI, Tier 1 CRC

3 Ontario Research Fund, Ontario Centres of Excellence, MITACS: MMSC project, PREA, Auto 21, CERG, Canadian Design Engineering Network, International Opportunities Fund, Environment Canada, Ontario Ministry of Health and Long-term Research, Canadian Health Services Research Foundation, American Health Assistance Foundation, National Heart Foundation, Ontario Ministry of Agriculture and Food, Nova Scotia Health Research Foundation, Nova Scotia Department of Agriculture & Fisheries, Canadian Foundation for Diabetic Research, Canadian Space Agency, Public Works & Government Services Canada

4 Atomic Energy of Canada (AECL), King Fahd University of Petroleum & Minerals, City University of Hong Kong, Microsoft, Canadian Nuclear Society, JP Bickell Foundation, Garfield Kelly Cardiovascular Research & Development Fund, Nuclear Waste Management Association

Table 2b presents the total external research funding for 2001-2007. As with Table 2a, the amounts in Table 2b represent only the confirmed funding and shall increase as the faculty members successfully secure funding from the various sources listed in the footnotes above and from industry. As the number of faculty members increases over the next few years, it is fully expected that the funding presented in Tables 2a and 2b will increase substantially.

As noted in Table 1, Faculty Members by Field, some faculty members have the qualifications and expertise to contribute equally to the teaching of courses and supervision of students in both fields. A separate category has been added to this table to denote the funding totals from that group.

Table 2b: Total External Research Funding by Source and Field - 2001-2007

	Granting Councils	Other Peer Adjudicated	Contracts	Others
Field 1	1,336,172	1,744,790	184,137	1,487,330
Field 2	1,224,530	1,971,397	64,771	127,787
Combined Fields 1 and 2	1,496,800	817,300	631,830	210,000

2.3 Graduate Supervision

Table 3 lists the completed and current numbers of thesis supervisions by faculty member. Table 3 shows that although UOIT does not yet have a graduate program in Nuclear Engineering, the faculty members are active in co-supervising students with professors at other institutions in Ontario and Canada. A number of the faculty members involved in the proposed program currently hold adjunct appointments at other universities. Table 4e outlines these adjunct appointments.

Table 3: Completed and Current Numbers of Thesis Supervisions by Faculty Member

	Completed			Current		
Member	**Master's**	**PhD**	**PDF**	**Master's**	**PhD**	**PDF**
Category 1						
Harvel, Glenn – Associate Professor	**3**	0	0	**1**	**1**	0
Pioro, Igor – Associate Professor	0	0	0	0	0	0
Category 3						
Aruliah, Dhavide – Assistant Professor	**(1)**	0	**1**	0	**(2)**	0
Bartfay, Emma – Associate Professor	**1**	0	0	0	0	0
Bartfay, Wally – Associate Professor	**9**	**1**	0	0	0	0
Bereznai, George – Professor	**2**	0	0	0	0	0
Berg, Peter – Assistant Professor	0	0	0	0	**1**	**1**
Buono, Pietro-Luciano – Assistant Professor	0	0	0	**1**	0	0
Dincer, Ibrahim – Professor	**9**	**7**	**14**	**5**	**6**	**6**
Forbes, Shari – Assistant Professor	0	0	0	**1**	**3**	0
Gabriel, Kamiel – Professor	**16**	**1**	**7**	**3**	**1**	**1**
Green, Mark – Professor	**13**	**9**	0	0	0	0
Green-Johnson, Julia – Assistant Professor	**1**	0	0	**1**	0	**1**

Holdway, Doug – Professor	**3**	**13**	**4**	**1**	**1**	**1**
Ikeda, Brian – Associate Professor	0	0	0	0	0	0
Jones-Taggart, Holly – Assistant Professor	0	0	0	0	0	0
Lewis, Greg – Assistant Professor	0	0	0	0	**1**	0
Lu, Lixuan – Assistant Professor	0	0	0	**1**	0	0
Marceau, Richard – Professor	**13**	**4**	0	0	0	0
Naterer, Greg – Professor	**7**	**6**	0	**11**	**2**	0
Nichita, Eleodor – Assistant Professor	0	0	0	0	0	0
Nokleby, Scott – Assistant Professor	0	0	0	**4**	0	**1**
Ren, Jing – Assistant Professor	0	0	0	0	0	0
Rosen, Marc– Professor	**10**	**1**	**2**	**4**	0	**2**
Waker, Anthony – Professor	**3**	**5**	0	0	0	0
Waller, Edward – Associate Professor	**2**	0	0	**1**	**1**	0
Category 4						
Bennett, Michael – Program Director	**27**	**2**	0	0	0	0
Category 6						
Dymarski, Mike – Sessional Lecturer	0	0	0	0	0	0
Ghafouri, Reza – Definite Term Complementary Academic Instructor	0	0	0	0	0	0
Keshavarz, Ali – Definite Term Complementary Academic Instructor	0	0	0	0	0	0
Meneley, Daniel – Adjunct Professor	**5**	**6**	0	0	0	0
Neil, Barry – Definite Term Complementary Academic Instructor	**1**	0	0	0	0	0
Rouben, Benjamin – Adjunct Professor	0	0	0	0	0	0
Schwanke, Peter – Sessional Lecturer	0	0	0	0	0	0

Adjunct Appointments of UOIT Faculty

The table below identifies the adjunct appointments held by core faculty of the proposed MASc/MEng Program in Nuclear Engineering at UOIT at other Canadian universities.

Member	**University**
Aruliah, D.	University of Toronto - Department of Computer Science University of Western Ontario - Department of Applied Mathematics
Bennett, M	University of Western Ontario
Berg, P.	University of Waterloo – Department of Mechanical Engineering
Dincer, I.	Carleton University – Department of Mechanical Engineering University of Waterloo – Department of Mechanical Engineering University of Toronto – Department of Mechanical and Industrial Engineering
Harvel, G.	McMaster University – Department of Engineering Physics
Lu, L.	University of Western Ontario – Department of Electrical Engineering
Naterer, G.	University of Manitoba – Department of Mechanical and Manufacturing Engineering (pending) University of Toronto – Department of Mechanical and Industrial Engineering (pending)
Nokleby, S.	University of Victoria – Department of Mechanical Engineering
Rosen, M.	Ryerson University – Department of Mechanical and Industrial Engineering University of Western Ontario – Department of Mechanical Engineering
Waker, A.	McMaster University
Waller, E.	Royal Military College of Canada – Department of Chemistry and Chemical Engineering University of New Brunswick – Department of Mechanical Engineering

2.4 Current Teaching Assignments

Table 4a shows the teaching loads for the 2006-2007 academic year. Table 4b and Table 4c show the teaching assignments for the 2005-2006 and 2004-2005 academic years. Note that UOIT admitted its first undergraduate students in the 2003-2004 academic year. The teaching loads for that year are listed in table 4d. In all four tables, the numbers in the brackets following the course code correspond to weekly Lecture/Laboratory/Tutorial hours, respectively.

Table 4a: Teaching Assignments for 2006-07

Category 1	Rank	Undergraduate	Graduate	Comments
Harvel, G.	**Associate Professor**	ENGR 2860U (3/2/1) Fluid Mechanics ENGR 4700U (3/0/1) Nuclear Plant Design & Simulation ENGR 3780U (3/0/1) Nuclear Reactor Design		
Pioro, I.	**Associate Professor**	ENGR 3930U (3/2/1) Heat Transfer ENGR 2010U (3/2/1) Thermodynamic Cycles		
Category 3				
Aruliah, D.	**Assistant Professor**	MATH 2010 (3/0/1) Advanced Calculus I MATH 2020 (3/0/1) Advanced Calculus II MATH 2860 (3/0/1) Differential Equations for Engineers MATH 3060 (3/0/0) Complex Analysis		
Bartfay, E.	**Associate Professor**	HLSC 3800 (3/0/0) Critical Appraisal of Statistics in Health Science HLSC 3805 (3/0/0) Epidemiology and Health Inquiry HLSC 1802(3/0/0) Introduction to Health Care Systems		
Bartfay, W.	**Associate Professor**	HLSC 2601 (3/0/0) Introdutcion to Health Management HLSC 2801 (3/0/0) Health, Illness and Therapeutics HLSC 3910 (3/0/0) Research Methods for Health Care Professionals		
Bereznai, G.	**Professor**	ENGR 4994U (1/4/1) Thesis Design Project ENGR 4640U (3/0/1) Nuclear Plant Operation ENGR 3860U (3/0/2) Introduction to Nuclear Reactor Technology		Dean, School of Energy Systems and Nuclear Science
Berg, P.	**Assistant Professor**	PHY 1010U (3/3/2) Physics I PHY 2030U (3/3/2) Mechanics I PHY 2040 (3/0/2) Mechanics II PHY 3060 (3/3/0) Fluid Mechanics PHY 4020 (3/0/0) Quantum Mechanics II		
Buono, P-L.	**Assistant Professor**	MATH 2060 (3/0/1) Differential Equations MATH 3020 (3/0/0) Real Analysis MATH 3070 (3/0/0) Algebraic Structures PHY 3040 (3/0/0) Mathematical Physics	MATH 837 Bifurcation Theory and Symmetry	At Queen's University
Dincer, I.	**Professor**	ENGR 2320U (3/1/1) Thermodynamics ENGR 3260 (3/0/0) Introduction to Energy Systems ENGR 3450 (3/2/1) Combustion and Engines ENGR 3930 (3/2/1) Heat Transfer ENGR 2860 (3/2/1) Fluid Mechanics		
Forbes, S.	**Assistant Professor**	CHEM 3530 (2/4/0) Instrumental Analytical Chemistry I CHEM 3540 (2/4/0) Instrumental Analytical Chemistry II FSCI 1010 (3/0/2) Introductory Forensic Science FSCI 2010 (3/3/3) Crime Scene Science		

Gabriel, K.	**Professor**			Associate Provost, Research
Green, M.	**Professor**	CSCI 1010 (3/0/2) Discrete Structures in Computing Science CSCI 1020 (3/0/2) Fundamentals of Programming (CSCI1600 prev) CSCI 3010 (3/0/2) Simulation and Modelling CSCI 3090 (3/0/2) Scientific Visualization and Computer Graphics MATH 2880 (3/0/2) Discrete Mathematics (=CSCI 1010)		
Green-Johnson, J.	**Assistant Professor**	BIOL 2030 (0/3/2) Cell Biology BIOL 2830 (3/0/0) Microbiology for Health Sc. (prev.BIOL 1820) BIOL 3030 (3/3/0) Microbiology and Immunology BIOL 3650 (3/0/0) Fundamentals of Nutrition		
Holdway, D.	**Professor**	BIOL 2010 (3/3/2) Introductory Physiology BIOL 4030 (3/0/0) Advanced Topics in Environmental Toxicology		
Ikeda, B.	**Associate Professor**	ENGR 3610U (3/0/0) Corrosion for Engineers ENGR 3640U (3/0/1) Radioactive Waste Management		
Jones-Taggart, H.	**Assistant Professor**	BIOL 2020 (3/3/2) Genetics and Molecular Biology		
Lewis, G.	**Assistant Professor**	MATH 1850 (3/0/2) Linear Algebra for Engineers MATH 2050 (3/0/0) Linear Algebra (with 1850) MATH 2070 (3/0/1) Numerical Methods/Computation Science I MATH 2072U MATH 3050 (3/0/0) Mathematical Modeling		
Lu, L.	**Assistant Professor**	ENGR 2360U (3/0/2) Electric Power Systems ENGR 3740U (3/3/1) Scientific Instrumentation ENGR 4730U (3/0/0) Reactor Instrumentation & Control		
Marceau, R.	**Professor**			Provost
Naterer, G.	**Professor**	ENGR 2640 (3/2/1) Thermodynamics and Heat Transfer		
Nichita, E.	**Assistant Professor**	ENGR 2500U (3/0/1) Intro to Nuclear Physics ENGR 3820U (3/0/1) Nuclear Reactor Kinetics RADI 3200U (3/0/0) Medical Imaging RADI 4320U (1.5/1/0) Medical Applications of Radiation Techniques		Dr. Waker (RADI 4320U)
Nokleby, S.	**Assistant Professor**	ENGR 4280 (3/1/1) Robotics & Automation ENGR 3390 (3/1/1) Mechatronics	ENGR 5260G Advanced Robotics and Automation	
Ren, J.	**Assistant Professor**	ENGR 2110 Discrete Mathematics ENGR 2250 Introductory Electronics		

Rosen, M.	**Professor**			Dean, Faculty of Engineering and Applied Science
Waker, A.	**Professor**	RADI 3220U (3/0/2) Radiation Biophysics and Dosimetry RADI 4320U (1.5/1/0) Medical Applications of Radiation Techniques RADI 4430U (1.5/.5/.5) Industrial Applications of Radiation Techniques RADI 4995U (1/4/1) Thesis Project I		
Waller, E.	**Associate Professor**	ENGR 2140U (1/0/1) Problem Solving, Modelling & Simulation ENGR 2950U (3/2/0) Radiation Protection ENGR 3570U (3/2/0) Environmental Effects of Radiation RADI 2100U (3/0/2) Radiological & Health Physics RADI 2110U (1/3/3) Health Physics Laboratory RADI 4430U (1.5/.5/.5) Industrial Applications of Radiation Techniques		Rob Anderson (ENGR 2140U) Dr. Waker (RADI 4430U)
Category 4				
Bennett, M.	**Program Director**		UN 0603 / Project Management for Nuclear Engineers	University of Western Ontario
Category 6				
Dymarski, M.	**Adjunct Associate**	ENGR 3150U (3/0/0) Nuclear Plant Chemistry		
Ghafouri, R.	**Adjunct Associate**	ENGR 3280U (3/1/0) Fundamentals of Computer-Aided Design Tools ENGR 3830U (3/0/1) Wind Energy Systems ENGR 4810U (3/0/0) Nuclear Fuel Cycles		
Keshavarz, A.	**Adjunct Associate**	ENGR 3670U (3/2/0) Shielding Design ENGR 3380U (3/2/1) Strength of Materials		
Meneley, D.	**Adjunct Professor**	ENGR 4520U (3/0/1) Nuclear Plant Safety Design ENGR 4660U (3/0/1) Risk Analysis Methods		
Neil, B.	**Adjunct Associate**	RADI 3550U (3/2/0) Radiation Detection & Measurement RADI 4440U (3/2/0) Radioisotopes & Radiation Machines		
Schwanke, P.	**Adjunct Associate**	ENGR 4880U (3/0/0) Principles of Fusion Energy		

Table 4b: Teaching Assignments for 2005-06

	Rank	Undergraduate	Graduate	Comments
Category 1				
Harvel, G.	**Associate Professor**	X		
Pioro, I.	**Associate Professor**	X		
Category 3				
Aruliah, D.	**Assistant Professor**	MATH 2010U Advanced Calculus I MATH 2020U Advanced Calculus II MATH 2860U Differential Equations for Engineers PHY 3040U Mathematical Physics		
Bartfay, E.	**Associate Professor**	HLSC 3800U Statistics & Critical Appraisal for Health Science HLSC 1802U Introduction to Health Care Systems		
Bartfay, W.	**Associate Professor**	NURS 3007U Professional Practice V (Health Communities) NURS 3507U Professional Practice VI (Health Communities HLSC 3910U Research		
Bereznai, G.	**Professor**	ENGR 4640U (3/0/1) Nuclear Plant Operation ENGR 3860U (3/0/2) Introduction to Nuclear Reactor Technology	UN 0801 Nuclear Plant Systems and Operation	McMaster University sessional lecturer
Berg, P.	**Assistant Professor**	PHY 1010U (3/1.5/1)2 (2 Sections) Physics I PHY 1020U (3/1.5/1)2 (2 Sections) Physics II PHY 2030U (3/0/2) Mechanics I PHY 2040U (3/0/2) Mechanics II PHY 3060U (3/0/0) Fluid Mechanics		
Buono, P-L.	**Assistant Professor**	MATH 1010 (2 sections) Calculus I MATH 2060U Differential Equations MATH2810U Advanced Engineering Mathematics		
Dincer, I.	**Professor**	ENGR 2320U (3/1/1) Thermodynamics ENGR 2860U (3/1/1) (2 sections) Fluid Mechanics		Programs Director, Faculty of Engineering and Applied Science
Forbes, S.	**Assistant Professor**	CHEM 3530U Instrumental Analytical Chemistry I CHEM 3540U Instrumental Analytical Chemistry I FSCI 1010U Introductory Forensic Science		
Gabriel, K.	**Professor**			Associate Provost, Research

Green, M.	**Professor**	CSCI 1010U (3/0/2) Discrete Structures in Computing Science CSCI 1020U (3/0/2) Fundamentals of Programming MATH 2080U (3/0/2) Discrete Mathematics SCIE 1910U (3/0/0) Science in Context		
Green-Johnson, J.	**Assistant Professor**	BIOL 1010U Biology I (50%) BIOL 2030U Cell Biology BIOL 2830U Microbiology for Health Science BIOL 3030U Microbiology & Immunology		
Holdway, D.	**Professor**	BIOL 2010U Introductory Physiology ENVS 1000U Environmental Science (25%) BIOL 3020U Principles of Pharmacology & Toxicology (50%)		
Ikeda, B.	**Associate Professor**	ENGR 3610U (3/0/0)		
Jones-Taggart, H.	**Assistant Professor**	HLSC 1200U Anatomy & Physiology I HLSC 1201U Anatomy & Physiology II BIOL 2020U Genetics & Molecular Biology		
Lewis, G.	**Assistant Professor**	MATH 1850U/MATH 2050U (2 sections) Linear Algebra for Engineers/ Linear Algebra MATH 2070/MATH 2072 Numerical Methods/Computational Science I (formerly Numerical Methods) MATH 3050 Mathematical Modelling		
Lu, L.	**Assistant Professor**	ENGR 3740U (3/3/1) Scientific Instrumentation ENGR 4730U (3/0/0) Reactor Instrumentation & Control		
Marceau, R.	**Professor**	X		Provost
Naterer, G.	**Professor**	ENGR 2640U (3/1/1) Thermodynamics & Heat Transfer		
Nichita, E.	**Assistant Professor**	ENGR 2500U (3/0/1) Introduction to Nuclear Physics ENGR 3780U (3/0/1) Nuclear Reactor Design ENGR 3820U (3/0/1) Nuclear Reactor Kinetics RADI 3200U (3/0/0) Introduction to Imaging	Reactor Physics (50%) - UNENE	
Nokleby, S.	**Assistant Professor**	ENGR 3200 (3/1.5/1.5) Engineering Graphics & Design ENGR 3270 (3/1/1) Kinematics & Dynamics of Machines ENGR 3390 (3/1/1) Mechatronics		
Ren, J.	**Assistant Professor**	X		
Rosen, M.	**Professor**			Dean, Faculty of Engineering and Applied Science
Waker, A.	**Professor**	RADI 3220U (3/0/2)		
Waller, E.	**Associate Professor**	ENGR 2140U (1/0/1) Problem Solving, Modelling & Simulation ENGR 2950U (3/2/0) Radiation Protection ENGR 3570U (3/2/0) Environmental Effects of Radiation		

		RADI 2100U (3/0/2) Radiological & Health Physics RADI 2110U (1/3/3) Health Physics Laboratory		
Category 4				
Bennett, M.	**Program Director**	SE312 (3/2) Introduction to Computer Networks SE313 (3/2) Operating Systems for Software Engineering		University of Western Ontario
Category 6				
Dymarski, M.	**Adjunct Associate**	X		
Ghafouri, R.	**Adjunct Associate**	X		
Keshavarz, A.	**Adjunct Associate**	X		
Meneley, D.	**Adjunct Professor**	X		
Neil, B.	**Adjunct Associate**	RADI 3550U (3/2/0) Radiation Detection & Measurement RADI 4440U (3/2/0) Radioisotopes & Radiation Machines		
Schwanke, P.	**Adjunct Associate**	X		

Table 4c: Teaching Assignments for 2004-05

Category 1	Rank	Undergraduate	Graduate	Comments
Harvel, G.	**Associate Professor**	X		
Pioro, I.	**Associate Professor**	X		
Category 3				
Aruliah, D.	**Assistant Professor**	MATH 2010U Advanced Calculus I MATH 2020U Advanced Calculus II MATH 2860U Differential Equations for Engineers MATH 2070/2072U Numerical Methods/Computational Science I (formerly Numerical Methods)		
Bartfay, E.	**Associate Professor**			On maternity leave
Bartfay, W.	**Associate Professor**		Advanced Topics in Health Promotion Nursing Research	University of Windsor
Bereznai, G.	**Professor**	X		Dean, School of Energy Systems and Nuclear Science
Berg, P.	**Assistant Professor**	PHY 1010U (3/1.5/1) (2 Sections) Physics I PHY 1020U (3/1.5/1) (2 Sections) Physics II PHY 2030U (3/0/2) Mechanics I		
Buono, P-L.	**Assistant Professor**	MATH 1010 (2 sections) Calculus I MATH 2860U Differential Equations for Engineers MATH2810U Advanced Engineering Mathematics		
Dincer, I.	**Professor**	ENGR 2320U (3/1/1) Thermodynamics ENGR 2860U (3/1/1) Fluid Mechanics		
Forbes, S.	**Assistant Professor**			
Gabriel, K.	**Professor**	X		Associate Provost, Research
Green, M.	**Professor**	SM2215 (2/0/1) SM 3121 (2/0/1) SM 4130 (2/0/1)		City University of Hong Kong

Green-Johnson, J.	**Assistant Professor**	BIOL 1010U Biology I BIOL 2030U Cell Biology BIOL 1810U Biochemistry for Health Science SCIE 1900U Participation in Science in Context (team taught course)		
Holdway, D.	**Professor**	BIOL 2010U Introductory Physiology ENVS 1000U Environmental Science		
Ikeda, B.	**Associate Professor**	X		
Jones-Taggart, H.	**Assistant Professor**	BIOL 2020U Genetics & Molecular Biology HLSC 1200U Anatomy & Physiology I HLSC 1201U Anatomy & Physiology I		
Lewis, G.	**Assistant Professor**	MATH 1850/2050 (2 sections) Linear Algebra for Engineers/ Linear Algebra CSCI 1020U Fundamentals of Programming		
Lu, L.	**Assistant Professor**	X		
Naterer, G.	**Professor**			
Nichita, E.	**Assistant Professor**	ENGR 2500U (3/0/1) Introduction to Nuclear Physics ENGR 3820U (3/0/1) Nuclear Reactor Kinetics		
Nokleby, S.	**Assistant Professor**	ENGR 3200 (3/1.5/1.5) Engineering Graphics & Design		
Ren, J.	**Assistant Professor**	X		
Marceau, R.	**Professor**	X		Provost
Rosen, M.	**Professor**			Dean, Faculty of Engineering and Applied Science
Waker, A.	**Professor**	X	**Waker, A.**	**Professor**
Waller, E.	**Associate Professor**	ENGR 2140U (1/0/1) Problem Solving, Modelling & Simulation ENGR 2950U (3/2/0) Radiation Protection RADI 2100U (3/0/2) Radiological & Health Physics RADI 2110U (1/3/3) Health Physics Laboratory		
Category 4				
Bennett, M.	**Program Director**	SE312 (3/2) Introduction to Computer Networks SE313 (3/2) Operating Systems for Software Engineering SE 454 (3/0) Software Law & Social Responsibility SE310 (3/0) Theoretical Foundations of Software Engineering		U. of Western Ontario and U. of Ottawa Knowledge Institute for Gov. Professionals

Table 4d: Teaching Assignments for 2003-04

Category 1	Rank	Undergraduate	Graduate	Comments
Harvel, G.	**Associate Professor**	X		
Pioro, I.	**Associate Professor**	X		
Category 3				
Aruliah, D.	**Assistant Professor**	Calculus 1 Numerical Analysis		University of Western Ontario
Bartfay, E.	**Associate Professor**	02-250 Basic Quantitative Methods in Social Sciences		University of Windsor
Bartfay, W.	**Associate Professor**			University of Windsor
Bereznai, G.	**Professor**	X	ENG PHY 6P03 Nuclear Plant Systems and Operation	McMaster University sessional lecturer
Berg, P.	**Assistant Professor**	Calculus II		Simon Fraser University
Buono, P-L.	**Assistant Professor**	Mathematical Methods for Chemists 1 Group Theory in Physics Vector Calculus		Université de Montréal
Dincer, I.	**Professor**			
Forbes, S.	**Assistant Professor**	Mysteries of Forensic Science	Research Issues Soils & Taphonomy	University of Western Australia
Gabriel, K.	**Professor**	X		Associate Provost, Research
Green, M.	**Professor**	SM1001 (2/0/2) SM2215 (2/0/1) SM 3120 (2/0/1) SM 3121 (2/0/1) SM4130 (2/0/1)		City University of Hong Kong
Green-Johnson, J.	**Assistant Professor**	BIOL 1820U Microbiology for Health Science CSCI 1000U Scientific Computing Tools (team taught) SCIE 1910U Science in Context (team taught)		

Holdway, D.	**Professor**	BIOL 1010U Biology I BIOL 1020U Biology II CSCI 1000U Scientific Computing Tools (team taught) SCIE 1910U Science in Context (team taught)		
Ikeda, B.	**Associate Professor**	X		
Jones-Taggart, H.	**Lecturer**	Pathophysiology & Pharmacotherapeutics : Relevance to Nursing Practice		University of Toronto
Lewis, G.	**Assistant Professor**	MATH 1850U (2 sections) Linear Algebra for Engineers CSCI 1020U Fundamentals of Programming		
Lu, L.	**Assistant Professor**			
Marceau, R.	**Professor**			Provost
Naterer, G.	**Professor**			
Nichita, E.	**Assistant Professor**	X		
Nokleby, S.	**Assistant Professor**			
Ren, J.	**Assistant Professor**			
Rosen, M.	**Professor**			Dean, Faculty of Engineering and Applied Science
Waker, A.	**Professor**	X		
Waller, E.	**Associate Professor**	Impact of Science and Technology on Society MCNPX for Dosimetry Calculations		
Category 4				
Bennett, M.	**Program Director**	SE312 (3/2) Introduction to Computer Networks SE313 (3/2) Operating Systems for Software Engineering SE 454 (3/0) Software Law and Social Responsibility SE 310 (3/2) Theoretical Foundations of Software Engineering SEG 3310(4/2) Object Oriented Analysis, Design & Programming SEG 4100(3/3) Software Project Management GNG 2100(3/0) Topics for Engineers	EMP5117 (3/0) Foundations of Software Engineering	University of Western Ontario University of Ottawa Knowledge Institute for Government Professionals

2.5 Commitment of Faculty Members from Other Graduate Programs and/or from Other Institutions

It is expected that, as UOIT expands, additional members from the Faculty of Engineering and Applied Science, the Faculty of Science and the Faculty of Health Sciences whose expertise complement the program's defined fields will become involved in the proposed programs.

3 PHYSICAL AND FINANCIAL RESOURCES

3.1 Library Resources

The University of Ontario Institute of Technology Library enriches the research, learning and teaching carried out by the university through exceptional information services and facilities to support all academic programs.

The construction of a new, state-of-the-art library for the UOIT was completed in the fall of 2004. Designed by internationally renowned Diamond and Schmitt Architects Incorporated, the 73,000-square-foot library serves students, faculty, and staff. The four-storey, $20.7-million library houses individual and collaborative learning spaces, research workstations, electronic classrooms, a reading room and periodicals collection. It offers a variety of learning spaces to suit individual learning styles and user needs. Its design also allows for future enlargement, up to double the original size.

Library collections and accessibility are discussed in detail in Appendix A. Paper copy and electronic resources supporting Nuclear Engineering are highlighted. Amongst the key databases are IEEE (Institute of Electrical and Electronics Engineers), INIS (International Nuclear Information System) and Compendex. While most databases offer indexing and/or full text for periodicals (magazines, journals, newspapers), many also offer full text for technical reports, conference proceedings and standards.

Students and faculty have access to library resources using their wireless laptops, anytime from anywhere. Within the building, patrons can work individually or collaboratively. Digital resources and complementary print collections are available and librarians provide students with the skills needed to navigate effectively through the information environment.

A more detailed presentation on the library resources is provided in Appendix A: Library Submission.

3.2 Laboratory Facilities

Students in the MASc and MEng programs will have access to major equipment and common facilities which have been or will be financially supported by the UOIT and through a wide range of grants and significant donations from the industry (both product manufacturers and service providers) and various government funding agencies, such as CFI, NSERC, and OCE. As the number of faculty members in the School increases and the research expertise broadens over the next few years, the facilities will be enhanced by major equipment acquisitions to maintain and upgrade laboratory equipment and to reflect state-of-the-art technology and industry-focused research.

Environmental Radiation and Corrosion Lab
This lab is located in UA 3680 in the University's Science Building. It provides a wide variety of radiation sources and equipment used to sample and measure radiation that may be encountered in the environment. Equipment is being acquired to conduct corrosion experiments under conditions that are expected to be encountered during the manufacture of nuclear fuel and its interim as well as long term storage and possible disposal in deep geological formations. The research is widely applicable to determination of hazards from airborne radioactive contaminants.

Applied Radiation Lab
The Applied Radiation Lab is located in Room ENGB 030 in the Ontario Power Generation Building. Additional neutron, gamma, alpha, and beta sources will be purchased to expand our research capability in Industrial Radiography, Radiation Physics, and Health Physics.

Aerosol and Radiation Research Lab
The lab is located in Room UAB 408 in the Science Building. Its equipment includes a medium scale aerosol test cell incorporating a Malvern Spraytech laser diffraction particle sizer, Anderson cascade impactor with throat extension for determining respirable fractions, and portable instrumentation such as a portable particle sizer, hot wire anemometer, and thermo-hygrometer.

Nuclear Computations and Control Research Lab
Distributed control systems are being used more and more frequently in nuclear power plants and related industrial systems. Parallel computing is frequently needed to solve complex simulations, such as those encountered in nuclear reactor core physics calculations. Computers in the lab are used for these and related applications. This lab is located in UA 4150 in the University's Science Building.

Radiation Protection and Scientific Instrumentation Lab
The laboratory, located in ENGB 035 in the Ontario Power Generation Building, houses the specialized equipment that helps to ensure that radiation is used safely. This includes safe use of the labs by students and staff, as well as developing techniques that protect the public and non-human biota from being exposed to unsafe levels of radiation. The equipment includes spectrometers, dosimeters, spectral and liquid scintillation analyzers, ion chambers, and NaI counting systems. Representative measuring and test instruments used in various nuclear applications, along with AD-DA and other signal processing equipment, are available for the use of researchers and graduate students.

Nuclear Simulation Lab
Simulation of complex systems, such as those used in power plants in general and nuclear plants in particular, is essential to their design, safety analysis, commissioning and operation. User interface has been found to have a critical role in the safe and reliable operation of nuclear power plants. The system installed in the Simulation Lab, comprised of six 70" Hitachi Visioncubes, Jupiter 960 Wall Controller, and server-type computers capable of multiple graphical outputs, can show up to six different displays generated by a computer or recorded on a CD or DVD. This can provide the real-time display of responses of various systems of a given plant simulation, or compare the responses of different simulations of various systems. This lab is located in ENG 3035 in the Ontario Power Generation Building.

Nuclear Design Laboratory
The School is planning to develop a Nuclear Design Laboratory to support advanced reactor concepts such as generation IV technology and integrated research programs combining nuclear design, thermalhydraulics, radiation, materials, and chemistry. (See further details in Section 1.6.)

Advanced Materials Engineering Laboratory
This facility is used to research wood plastic composites and polymer bonding, along with other areas such as the development of production processes and the characterization of new composites, nano-materials, bio-based materials, and foamed materials. UOIT is unique in its

capability to test the effects of exposure to various types and amounts of radiation on material properties. This laboratory is located in ENG 1030 in the Ontario Power Generation Building.

Centre for Engineering Design, Automation, and Robotics (CEDAR)
A group of faculty members from the Faculty of Engineering and Applied Science has been awarded a New Opportunities Grant from the Canada Foundation for Innovation (CFI) to purchase infrastructure for the Centre for Engineering Design, Automation, and Robotics (CEDAR). The initial infrastructure for CEDAR will comprise a reconfigurable manipulator system, a mobile-manipulator system, and a machine vision system. The facilities will be used to conduct research into robotics, mechatronics, and manufacturing. The CEDAR facilities will also be used in conjunction with the Integrated Manufacturing Centre (IMC) to increase the IMC's ability to conduct research into flexible manufacturing. CEDAR currently has two affiliated laboratories: the Intelligent Robotics and Manufacturing Laboratory and the Mechatronic and Robotic Systems Laboratory. Nuclear-specific applications include research into the use of robotics and mechatronics in the manufacture of fuel bundles, the handling of irradiated fuel, and the use of remote inspection equipment in radiological fields.

3.3 Computing Resources

Individual supervisors will provide computer facilities, including appropriate computer systems and software packages, for their MASc and MEng-Project students. These facilities will enable them to carry out their research, to meet their computational, modeling and simulation needs, and to provide them with access to the internet, email and library resources (such as online journals and conference proceedings). Graduate students will also have the option to subscribe to UOIT's laptop program. UOIT's laptop program provides students with a current model laptop that is equipped with a suite of program specific software. Additional shared computer facilities (several hundred PCs) are available in the Learning Commons and library.

Through its contacts with industry, the School has been able to acquire real-time simulation software for the currently operating OPG nuclear-electric units, as well as design codes used by AECL, such as RFSP, CATHENA, TUF and FLUENT code.

UOIT has joined the PACE Program – Partners for the Advancement of Collaborative Engineering Education[1]. PACE is a program between General Motors, Sun Microsystems and UGS that provides state-of-the-art hardware and software for engineering schools. Dedicated engineering computer labs featuring state-of-the-art workstations and software will be established at UOIT through PACE. Both MASc and MEng graduate students will have full access to the PACE hardware and software located in these labs.

UOIT is a member of SHARCNET (Shared Hierarchical Academic Research Computer Network (http://www.sharcnet.ca), a high-performance computing consortium of 9 universities and 2 colleges based in South-Central Ontario. A high-speed optical network connects the computing facilities located at each institution. At present, the majority of the computational facilities are located at McMaster University, the University of Western Ontario and the University of Guelph; however, UOIT faculty members and their research groups have access to any part of this state-of-the-art computing facility. SHARCNET was successful in a recent 2004 CFI Innovation Fund competition ($48.3M), which will result in a significant expansion of the facility. With the new funding, it is projected that SHARCNET will become one of the top 100 High-Performance Computing facilities in the world. As part of this expansion, UOIT will acquire a small 'development cluster' of

1 Source: PACE web site: http://www.pacepartners.org/

approximately 32 processors that will be located on-site. This, combined with other local equipment, will give students involved in the Master's programs in ECE the ability to work on cutting-edge research in their respective fields. AccessGrid facilities will also be installed as part of the local SHARCNET installation. AccessGrid is an ensemble of resources including multimedia large-format displays, presentation and interactive environments, and interfaces to Grid middleware and to visualization environments, to support group-to-group interactions across SHARCNET. These facilities will facilitate collaboration by faculty members and students across SHARCNET.

3.4 Space

The School of Energy Systems and Nuclear Science is located in UOIT's Engineering and Science Buildings. These are brand new buildings that feature office space for faculty members and graduate students in addition to research lab space. The current total research space allocated to engineering is 1,500 m^2. Currently the School is using research laboratory space in the order of 100 m^2; an additional 500 m^2 is expected to be added over the next two or three years.

All offices and research spaces are wired for access to UOIT's network. In addition, wireless and wired access are available throughout the Engineering and Science Buildings as well as the library and other spaces on campus. Faculty members have private offices with telephone lines. Faculty office space averages 13 m^2 and faculty member research space averages ~25 m^2.

Graduate students will have access to shared office facilities and/or research labs. There will be shared office space available for both MASc and MEng students who are teaching assistants. In addition, there will be shared computer facilities along with a limited number of shared spaces for both MASc and MEng students to work. The various shared spaces will provide the opportunity for MASc and MEng students to interact with one another. The amount of space allocated to graduate students will increase as the programs come online. It is expected that the majority of graduate students will have their office space within the research laboratories of their respective supervisors.

UOIT has a plan for two more large buildings, pending government approval. The Nuclear Engineering program, with a heavy focus on research and graduate studies, is an active supporter of UOIT's mandate in the advancement of higher education.

3.5 Financial Support of Graduate Students

MASc Students

Every MASc student offered admission to a graduate program at the School of Energy Systems and Nuclear Science should be able to complete the selected program regardless of financial status.

It is expected that the average support for MASc students will be approximately $16,000 per year, with funding coming from a variety of sources, including:

- External Awards – These include NSERC postgraduate awards and provincial awards. In addition to the NSERC-UNENE IRC, several smaller UNENE research awards (in the order of $100-300 K over three years) are available. Other companies in the nuclear industry, including OPG, Bruce Power, AECL, SNC-Lavallin, Cameco, Babcock and Wilcox, Wardrop, and Nordion are expected to offer scholarships and bursaries.

- Teaching Assistantships – MASc students will be eligible to earn up to approximately $8,000 per year through teaching assistantships.

- Graduate Research Awards and Research Assistantships – Additional support from individual supervisors will be available to students. Faculty members have been successful in getting research contracts from industry, and some of these contracts are expected to be used to fund graduate student research.
- Work-Study and Other Forms of Employment-Based Learning.
- Provincial Loan Programs.

Once the program achieves steady state, the School of Energy Systems and Nuclear Science hopes to be able to offer a number of merit-based Research Excellence Awards, as well as to provide additional funding which can be distributed on a needs basis in the form of bursaries.

It is expected that the majority of funding for MASc students will come from Research and Teaching Assistantships. Normally, funding will not be provided to part-time students.

MEng Students

Full-time MEng students will have access to financial support through teaching and research assistantships and work-study placements. Normally, funding will not be provided to part-time MEng students who are working full time and unavailable for teaching and research assistance.

Financial Counseling

UOIT's Financial Aid and Awards Office offers a range of financial services, including financial counseling, to students.

4 PROGRAM REGULATIONS AND COURSES

4.1 The Intellectual Development and the Educational Experience of the Student

Graduate students taking part in the Master's program in Nuclear Engineering will have the opportunity to participate in a variety of challenging educational experiences. A high degree of quality in the development of the student will be fostered and monitored by the faculty members involved in the program.

The faculty members of the Master's program have a strong demonstrated commitment to pursuing scholarly activities at levels approved by international peers in their respective areas of specialization. The University is also committed to hiring new professors with proven track records in research who will augment and complement the present membership.

There are four general objectives for the graduate program in Nuclear Engineering:

- Depth: To provide students with an understanding of the fundamental knowledge prerequisites for practice and advanced study in the field of nuclear engineering; this includes principles, analysis techniques and research design methodologies

- Breadth: To provide students with the broad and advanced education necessary for productive careers in the public or private sectors or in academia

- Professionalism: To facilitate the development of skills necessary for clear communication and responsible teamwork, and to inspire professional attitudes and ethics, so that students are prepared for modern work environments and for lifelong learning

- Learning Environment: To provide a safe and high quality learning environment that will enable students to pursue their goals through innovative graduate programs that are rigorous, challenging and supportive

These objectives will be achieved in the following ways:

Depth: The first objective will be achieved in part by such courses as NUCL 5020G Mathematical Methods in Nuclear Applications, NUCL 5030G Transport Theory, NUCL 5040G Monte Carlo Methods, NUCL 5050G Applied Risk Analysis, NUCL 5060G Nuclear Concepts for Engineers and Scientists, NUCL 5070G Environmental Modelling, and NUCL 5090G Occupational Health and Safety, by taking courses of increasing complexity in the student's chosen field, and by meeting the research requirements in one of: NUCL 5001G MASc Thesis, NUCL 5006G Industrial Research Project, or NUCL 5009G Graduate Research Project.

Breadth: The second objective will be achieved primarily through the wide selection of courses offered by the program. In addition to study in their chosen fields, opportunities exist for students to select subjects from a wide range of theoretical and practical offerings. Prior to entry to the program, each student will be paired with a thesis supervisor under whose guidance the student will carry out a thesis or research project. On completing the proposed program, students will have achieved a level of engineering maturity which comes from successful completion of a thesis or project. Through participation in the program, students will develop skills in problem solving, experimental design, and critical analysis, as well as research initiative and the ability to work independently. Where possible, they will be given the opportunity to

attend national and international conferences and encouraged to publish in peer-reviewed journals.
Professionalism: The third objective will be achieved through effective program design. Students will attain the requisite knowledge and skills to continue on to a PhD program in nuclear engineering or science. They will acquire expertise in a particular area of nuclear engineering, thereby developing technical skills of interest to employers across the industrial, institutional and regulatory sectors. NUCL 5010G Project Management for Nuclear Engineers, and ENGR 5750G Software Quality Management were specifically included in the program as a result of advice from industry.

Learning Environment: The fourth objective will be achieved by including research components and written and oral presentations in the majority of the courses and by providing a supportive faculty with extensive industrial and life-long learning experience. The Graduate Seminar course (ENGR 5003G) is designed to help students enhance their abilities to effectively communicate technical information to an audience with diverse scientific backgrounds.

The vision, mission and values of the UOIT provide the foundation for all activities and are reflected in the plans for the intellectual development and educational experience of graduate students in the School of Energy Systems and Nuclear Science.

VISION

The University of Ontario Institute of Technology is an innovative and market-oriented institution, pursuing inquiry, discovery and application through excellence in teaching and learning, value-added research and vibrant student life.

MISSION

- Provide career-oriented undergraduate and graduate university programs with a primary focus on those programs that are innovative and responsive to the needs of students and employers
- Advance the highest quality of research
- Advance the highest quality of learning, teaching, and professional practice in a technologically enabled environment
- Contribute to the advancement of Ontario and Canada in the global context with particular focus on Durham Region and Northumberland County
- Foster a fulfilling student experience and a rewarding educational (work) environment
- Offer programs with a view to creating opportunities for college graduates to complete a university degree

VALUES

- Integrity and Respect: We will treat each other with dignity, including those with challenges.
- Honesty and Accountability: Our actions reflect our values, and we are accountable for both.
- Intellectual Rigor: We strive for excellence and challenge convention.

The Academic Unit

In keeping with its mission to foster a fulfilling student experience and a rewarding educational

(work) environment, UOIT has developed operational and support processes and services to enhance the learning environment for students.

The vision of the School of Energy Systems and Nuclear Science is to become recognized world-wide as a leading research and educational unit that creates, enhances and transfers knowledge to individuals and organizations in the application of nuclear, radiation and other energy technologies for the betterment of society and the protection of the environment. We will provide for our graduate students a rigorous education and endeavour to instill in them the attitudes, values, and vision that will prepare them for a lifetime of continued learning and leadership in their chosen careers. We engage in scholarship of discovery, application, and integration.

In order for our students and faculty members to engage in scholarship of discovery, application, and integration, UOIT has made every effort to provide state-of-the-art learning resources, including the library, learning technologies, and laboratories. In addition, academic support staff and student support services also contribute to the operation of the School and provide service, guidance and support for graduate students.

As described in Section 2 of this Brief, a team of well-qualified faculty members is in place to support students and monitor their progress and to ensure that the program is of high quality and meets graduate level standards. There is a plan to hire additional faculty members to add to the strengths of the existing team.

Program Learning Outcomes

Graduates of the School of Energy Systems and Nuclear Science graduate programs shall be able to:

1. Demonstrate specialized knowledge and understanding of essential facts, concepts, principles, and theories in a specific area of advanced study
2. Recognize and be guided by social, professional, and ethical expectations and concerns involved in advanced education and research
3. Effectively use advanced tools for research
4. Apply the principles of effective data management, information organization, and information-retrieval skills to data of various types
5. Utilize analytical, methodological, interpretive and expository skills in conducting research
6. Expand and enhance the application of specific and well-concentrated research to problems and practice in Nuclear Engineering
7. Critically evaluate advanced information and knowledge and examine their application in nuclear engineering practice
8. Understand, explain, and solve problems using quantitative and qualitative methods
9. Design and conduct experiments, analyze and interpret experimental data and/or develop theories and design computational algorithms to predict and explain the interaction of radiation with matter and its consequences

10. Demonstrate effective oral and written communication skills

11. Appreciate the importance of, and develop strategies for, lifelong learning
The objectives for the Master's program are achieved through either a combination of course work and a thesis or project, or solely course work, depending on which option the student selects. All Master's students will use quantitative and qualitative research methodologies as they engage in research required for projects included in most of the courses.

The combination of courses and/or projects and research will be designed collaboratively between the student and an assigned faculty advisor/mentor. Each learner will have the opportunity to develop the prerequisites for specialized practice of, or for advanced study in, the field of nuclear engineering. Learning activities and materials in graduate courses will be carefully designed to ensure that learners are deliberately exposed to study which is at, or informed by, the forefront of engineering theory and practice.

The courses have been designed to give students in-depth learning in nuclear engineering, opportunities for advanced development of generic skills such as communication and teamwork, as well as participation in the scholarly activities of research, seminars, and presentations.

Throughout the curriculum, learning activities are planned and student progress monitored to ensure that safety, professional guidelines, and ethical responsibilities relevant to nuclear engineering and specific areas of advanced study are modelled, developed, and evaluated.

Learning Community

UOIT is committed to providing innovative programs through excellence in teaching and learning, value-added research and "vibrant student life." The Master's program in Nuclear Engineering exemplifies this commitment. The physical design of the university environment provides many places and spaces for groups to meet and interact, for academic and social purposes. The technological links available to students ensure that a network of communication and support among students and between students and university resources is established and strengthened during their years at UOIT. Facilities and personnel are available to support learning and development in all areas – academic, physical, social and emotional.

The student-centered philosophy of UOIT is designed to develop and continually enhance a strong sense of academic community, in which students, faculty, support staff and administrators share ideas and experiences. Students in the Master's program will benefit from the relationship with faculty members in a learning partnership.

Regularly scheduled scientific presentations, guest speakers, and research colloquia which are open to the University community are already a part of academic life at UOIT. With the development of graduate programs in Nuclear Engineering, the number of seminars offered by the School of Energy Systems and Nuclear Science and the Faculty of Engineering and Applied Science will increase. In addition, the School of Energy Systems and Nuclear Science will invite recognized experts and leading-edge researchers to present seminars and to offer advice on student and faculty research. UOIT's rich network of industry and academic contacts, as exemplified by its close relationship with the Canadian nuclear industry and the University Network of Excellence in Nuclear Engineering (UNENE), will provide faculty and students with access to exceptional researchers and industry professionals.

Scholarly Activities

As can be seen in the course outlines, students are required to undertake significant independent work and to prepare and deliver reports and seminars. This facilitates the development of leadership, organization, communication, and professional presentation skills. These sessions will be conducted in an environment which supports intellectual debate, allows for critique and constructive feedback, and encourages reflective practice.

All students in the Nuclear Engineering graduate program will be encouraged to attend professional conferences and educational sessions which may take place at UOIT or outside the University. Master's students will be encouraged to attend and participate in conferences and workshops relevant to their specialized areas of interest. Financial support will be made available by faculty supervisors. Students will be encouraged and mentored to present their thesis and project work at professional conferences and to other audiences through industry and academic networks.

4.2 Program Regulations

4.2.1 Admission Requirements

The minimum admission requirements for the MASc and MEng program are as follows:

- Completion of an undergraduate science or engineering degree from a Canadian university, or its equivalent from a recognized institution.

- Overall academic standing of at least a B (GPA = 3.0 on a 4.0/4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent, although a B+ is preferred for MASc applicants. Submission of one certified copy of each previous undergraduate and graduate transcript directly from the granting institute is required. It is the student's responsibility to provide a certified English translation of the transcript if the original is in another language. Applicants may be required to submit a brief description of the courses listed on their official transcripts or provide a copy of the relevant calendar where they are listed.

- A minimum of two letters of reference from persons having direct knowledge of the applicant's academic competence. Academic references are preferred; however professional references will be accepted. Letters of reference should come from individuals under whom the applicant has worked closely or studied. The quality of the letters will be assessed by the Graduate Committee of the School of Energy Systems and Nuclear Science to make sure relevant requirements have been met.

- Proof of English proficiency is needed from those applicants whose first language is not English.

- As part of the application form, students are expected to provide a one-page Statement of Interest outlining their objectives in undertaking graduate study. Applicants may describe career aspirations/plans, specific research interests (if known), and experience relevant to their interests. If a potential thesis supervisor has been contacted, he/she must be identified in the Statement of Interest.

- Since close technical contact with a faculty member is an essential part of graduate education in engineering and science, MASc students must find a professor, who specializes in the applicant's desired area of research, willing to act as a supervisor, prior to being accepted into

the program. In the event the MASc student cannot find a project supervisor, the student must transfer into the MEng-Course option.

Language Requirements

All applicants are required to give evidence of their oral and written proficiency in English. This requirement can be satisfied with one of the following criteria:

i) The student's mother tongue or first language is English.

ii) The student has studied full-time for at least three years (or equivalent in part-time studies) in a secondary school or university where the language of instruction and examination was English.

iii) The student has achieved the required proficiency on one of the tests in English language acceptable to the University of Ontario Institute of Technology: TOEFL (computer based) 220 or TOEFL (paper based) 560 or IELTS 7 or MELAB 85 or CAEL 60.

4.2.2 Degree Requirements

Table 5a summarizes the degree requirements for the MASc and MEng programs. For each of these programs, students must successfully complete 30 credits.

Table 5a: Summary of Degree Requirements

Program	Required – Credits	Options - Credits	Total Credits
MASc	NUCL 5001G MASc Thesis plus NUCL 5003G – Seminar - 15 Credits	5 Courses - 15 Credits	30
MEng – Course		10 courses - 30 Credits	30
MEng – Graduate Research Project	Project – 9 credits	7 courses – 21 Credits	30
MEng - Industrial Research Project	Project – 6 credits	8 courses – 24 Credits	30

MASc: For the MASc program, students must complete five courses worth a total of 15 credits and NUCL 5003G – Seminar. The student is required to write a research thesis, worth 15 credits. Upon completion, the student must defend the thesis in front of an examination committee comprised of his or her supervisory committee plus an external examiner.

MEng - Course Option: Students must complete 10 courses worth a total of 30 credits.

MEng - Graduate Research Project Option: Students must complete 7 courses (21 credits) as well as the MEng Graduate Research Project (9 credits). Under the supervision of a faculty member, students have the opportunity to integrate and synthesize knowledge gained throughout their program of study. The chosen topic will be dependent on the area of specialization of the

student, using resources normally available on campus. Students are required to write a report and give a presentation on their completed project.

MEng - Industrial Research Project Option: Students in this option must complete 8 courses (24 credits) and an Industrial Project (6 credits). Students enrolled part-time in this program option may designate a period of approximately four months in an industrial laboratory to carry out an industry-oriented project under the supervision of a suitably qualified staff engineer or scientist, as well as a University co-supervisor. The School will work with the candidate and consult the candidate's employer to arrange a suitable project. A satisfactory project topic and appropriate arrangements are required for the project to be approved by the School; it is possible that, in some cases, this may not be feasible. Upon completion, the candidate will submit a substantial report on the project and make a presentation on it at the University. The Industrial Research Project can only be undertaken after at least half the required courses have been taken.

MASc students must spend a minimum of one academic year of full-time study in residence at UOIT. The maximum time for completion of the MASc and MEng degree for full-time students is three years; for part-time students, it is six years. This is calculated from the date the student entered the program. No financial support will be available from the Faculty after two years.

Section 4.4 provides a list of available courses, followed by detailed course descriptions and outlines.

The selection of optional courses for credit will require the approval of the Graduate Program Director; this is usually based on a recommendation from the student's thesis or project supervisor or faculty advisor.

Progress Reports

After completing the first year of their program and each year thereafter, MASc students must complete a progress report that outlines what they have done in the previous year and their objectives for the following year. This progress report must be submitted to the student's supervisory committee. Permission to continue in the program will be based on a satisfactory report as determined by the student's supervisory committee.

Thesis and Project Procedures

Thesis and major project procedures and evaluations will be conducted in accordance with the guidelines outlined in Section 6 of the General Policies and Procedures for Graduate Studies. (See Appendix B.)

Distance Delivery

The programs will not be delivered in a distance delivery manner at the present time. In the future, it is expected that distance/hybrid delivery of parts of the program will be used where the subject matter permits. Distance delivery of courses will be designed to comply fully with Section 31 of the OCGS By-Laws governing distance delivery.

A WebCT course website will play a role in the delivery of resources for all courses: syllabus, schedule, assignments, solutions to homework assignments and tests, and past exams, handouts, and supplementary notes. Also, all UOIT classrooms and labs are equipped with VCR, DVD, data

projectors, and wired and wireless Internet access.

4.3 Part-time Studies

To facilitate access to all potential students, part-time studies will be permitted. It is especially important to allow engineers and scientists in local industries to have access to the MEng program; therefore many graduate courses will be offered in the late afternoon or early evening. Part-time students may have course load restrictions. Part-time students must complete the requirements of the degree in five years.

4.4 Total Graduate Courses Listed

Table 5b (beginning on page 45) lists the proposed graduate courses to be offered, followed by detailed outlines for the proposed courses.

In accordance with OCGS by-laws, students in the Nuclear Engineering graduate program may take no more than one-third of their courses from the undergraduate courses listed in Table 5b, or other 4xxxU courses specifically approved by the SESNS Dean or designate, provided the student did not take similar courses as part of his/her undergraduate degree. Graduate students enrolled in undergraduate level courses will be expected to engage in activities and assignments requiring them to demonstrate a more advanced level of learning and application.

Students must take at least half of their graduate courses from the list of NUCL 5xxxG courses in Table 5b. Courses not listed in Table 5b and offered by other Faculties at the UOIT or other universities can only be taken for credit if approved by the SESNS Dean or designate.

Outlines for all courses are provided in Appendix C.

Table 5b: Listing of Proposed Graduate Courses

Page	Core Graduate Courses to be offered by School of Energy Systems and Nuclear Science
	NUCL 5001G MASc Thesis
	NUCL 5003G Seminar
	NUCL 5004G Directed Studies
	NUCL 5005G Special Topics
	NUCL 5006G Industrial Research Project
	NUCL 5009G Graduate Research Project
	NUCL 5010G Project Management for Nuclear Engineers
	NUCL 5020G Mathematical Methods in Nuclear Applications
	NUCL 5030G Transport Theory (cross listed with MCSC 6160G)
	NUCL 5040G Monte Carlo Methods (cross listed with MCSC 6165G)
	NUCL 5050G Applied Risk Analysis
	NUCL 5060G Nuclear Concepts for Engineers and Scientists
	NUCL 5070G Environmental Modelling
	NUCL 5080G Advanced Topics in Environmental Degradation of Materials
	NUCL 5090G Occupational Health and Safety
	NUCL 5200G Reactor Physics
	NUCL 5210G Advanced Reactor Physics
	NUCL 5215G Advanced Reactor Engineering
	NUCL 5220G Fuel Management in Nuclear Reactors
	NUCL 5230G Advanced Nuclear Thermalhydraulics
	NUCL 5240G Heat Transfer in Nuclear Reactor Applications
	NUCL 5250G Power Plant Thermodynamics
	NUCL 5260G Reactor Containment Systems
	NUCL 5270G Control, Instrumentation and Electrical Systems in CANDU based Nuclear Power Plants
	NUCL 5280G Advanced Reactor Control
	NUCL 5290G Advances in Nuclear Power Plant Systems
	NUCL 5300G Advanced Topics in Radioactive Waste Management
	NUCL 5400G Advanced Radiation Science
	NUCL 5410G Physics of Radiation Therapy
	NUCL 5420G Aerosol Mechanics
	NUCL 5430G Advanced Dosimetry
	NUCL 5440G Advanced Radiation Biophysics and Microdosimetry
	NUCL 5450G Non-destructive Analysis
	NUCL 5460G Industrial Radiography
	NUCL 5470G Nuclear Forensic Analysis

Page	**Elective Graduate Courses from the Faculty of Engineering and Applied Science**
	ENGR 5010G Advanced Optimization
	ENGR 5121G Advanced Turbo Machinery
	ENGR 5122G Computational Fluid Dynamics
	ENGR 5740G User Interface Design
	ENGR 5750G Software Quality Management
	ENGR 5910G Embedded Real-Time Control Systems
	ENGR 5920G Analysis and Control of Nonlinear Systems
	ENGR 5930G Adaptive Control
	ENGR 5940G Intelligent Control Systems
	ENGR 5960G Power System Operations, Analysis and Planning
	Elective Graduate Courses from the Faculty of Science
	MCSC 6010G Mathematical Modelling
	MCSC 6030G High-Performance Computing
	MCSC 6120G Numerical Methods for Ordinary Differential Equations
	MCSC 6125G Numerical Methods for Partial Ordinary Differential Equations
	Undergraduate Nuclear Engineering Courses available for Graduate Credit
	ENGR 4510U Nuclear Plant Chemistry
	ENGR 4520U Nuclear Plant Safety Design
	ENGR 4610U Corrosion for Engineers
	ENGR 4620U Radioactive Waste Management Design
	ENGR 4640U Nuclear Plant Operations
	ENGR 4660U Risk Analysis Methods
	ENGR 4670U Shielding Design
	ENGR 4680U Nuclear Materials
	ENGR 4700U Nuclear Plant Design and Simulation
	ENGR 4730U Reactor Control
	ENGR 4780U Nuclear Reactor Design
	ENGR 4810U Nuclear Fuel Cycles
	ENGR 4880U Principles of Fusion Energy
	Undergraduate Health Physics and Radiation Science Courses available For Graduate Credit
	RADI 4220U Radiation Biophysics and Dosimetry
	RADI 4430U Industrial Applications of Radiation Techniques
	RADI 4440U Radioisotopes and Radiation Machines
	RADI 4550U Radiation Detection and Measurement

5 OUTCOMES

5.1 Enrolment and Graduations

As this is an application for a new program, this section is not applicable.

5.2 Employment

Employment records of the graduates from the program will be maintained on an ongoing basis.

5.3 Publications

Publication records of the graduates from the program will be maintained on an ongoing basis.

5.4 Projected Graduate Intake and Enrolments

Table 6 shows the projected graduate student enrolment (both full-time and part-time students) over the next seven years. As additional faculty will be hired over the next few years, the planned enrolment in the program is expected to increase.

Table 6: Projected Intake and Enrolments for MASc and MEng Programs

YEAR	FULL-TIME				PART-TIME				TOTAL ENROLMENT	
	Intake		Enrolments		Intake		Enrolments		MASc	MEng
	MASc	MEng	MASc	MEng	MASc	MEng	MASc	MEng		
2007	5-10	5-10	5-10	5-10	1-3	5-10	1-3	5-10	6-13	10-20
2008	10-15	5-10	15-25	10-20	1-3	10-15	2-6	20-25	17-31	30-45
2009	10-15	5-10	20-30	10-20	1-3	15-20	3-9	30-45	23-39	40-65
2010	10-20	10-15	20-35	10-25	1-3	15-20	3-9	30-45	23-44	40-70
2011	10-20	10-15	20-40	10-30	1-3	15-20	3-9	30-45	23-49	40-75
2012	10-20	10-15	20-40	10-30	1-3	15-20	3-9	30-45	23-49	40-75
2013	10-20	10-15	20-40	10-30	1-3	15-20	3-9	30-45	23-49	40-75

Appendix A:

LIBRARY SUBMISSION TO ONTARIO COUNCIL OF GRADUATE STUDIES (OCGS) FOR

THE MASTER OF APPLIED SCIENCE AND MASTER OF ENGINEERING PROGRAMS IN NUCLEAR ENGINEERING

Compiled by: Carol Mittlestead, B.A. (Hon), M.L.S., Associate Librarian

Introduction:

This document discusses the Library in terms of the collection and its accessibility with respect to the University of Ontario Institute of Technology's Master of Science and Master of Engineering in Nuclear Engineering as offered by the School of Energy Systems and Nuclear Science within the Faculty of Engineering and Applied Science. The collection includes both paper and electronic resources -- books, indexes, periodicals (journals, magazines, newspapers), librarian recommended web sites, and data sets. There are plans to enhance and expand D-Space, an institutional repository system that captures, stores, indexes and preserves digital research material; indexing and abstracting for the Library's Special Collection of nuclear reports is hosted through D-Space. Accessibility addresses the physical presence of the Library, onsite reference assistance, the Library web page www.uoit.ca/library as a 24/7 portal, and interlibrary loan and document delivery.

Collections:

It is understood that the Library's acquisition plan must be based on evolving pedagogical needs as determined by the academic faculties. In close liaison with the deans and professors, subject specialist librarians will define collection development strategies for the ongoing curriculum-based purchase of resources as well as for the evaluation and review of existing material.

Books:

The Library offers a small but comprehensive collection. At present, there are approximately 78,000 volumes on the shelves. In August 2004, the Library took possession of its new building (described below) and this additional space allows for the relatively quick expansion of the collection to 160,000 texts. Currently there 9,000 engineering volumes on the general shelves; 651 of these books focus specifically on nuclear engineering and radiation. While the preference is to acquire standards, reports and conference proceedings in electronic format (see below), this is not always possible or feasible. Selected items from key scientific organizations such as the ASTM (American Society for Testing Materials), the CSA (Canadian Standards Association), the ANSI (American National Standards Institute), the AECL (Atomic Energy of Canada Limited), and the NCRP (National Council on Radiation Protection and Measurements) do appear on the shelves as well. In 2005/6, over $72,000 was spent on engineering books; $78,000 is the anticipated sum for the 2006/7 fiscal year and this amount is expected to increase by 4 to 5 percent for several successive years. The numbers given above do not include the 1,750 international nuclear engineering reports acquired through donations and housed in the Library's Special Collections Room. Most of these reports were published in the 1970 to 1990 time frame, but some date as far back as the early 1950s. While Canada is well-represented through national reports such as those published by the Canadian Nuclear

Association and Canadian Nuclear Society, materials from the United States, United Kingdom, France, Italy, Sweden, Australia and other countries and international bodies are also included in this special collection.

While this is only the fourth year that UOIT has offered courses, with the Library understandably being in a significant growth phase, this Masters program is particularly well placed in terms of resources. From its onset, UOIT has been building its reputation on science-based programming in mathematics, physics, chemistry and biology; Library collection development has echoed this. There are now over 12,000 science volumes that would lend support to the MA and MSc in Nuclear Engineering and the Library will continue to make purchases at a steady rate. Similarly, UOIT has made application for other postgraduate engineering based programs (Materials Science, Electrical and Computer Engineering, Automotive Engineering, Applied Bioscience) and the Library has been acquiring more high end academic materials in anticipation of these offerings as well. Through the purchase of books that focus on the drafting of research proposals, grant writing, presentation techniques, technical communications, and university teaching, the Library is addressing the practical information needs of all post graduate students.

In sum, the Library's goal is to increase its paper copy holdings by 2,000 to 3,000 volumes per year for several successive years with a current projected cost of $400,000. to $450,000. per annum. Books are selected primarily by Subject Specialist Librarians both directly from noteworthy academic publishers (e.g. Wiley, CRC Press, Sage, Elsevier, Academic Press, Addison-Wesley, Kluwer, Springer-Verlag, Pearson Prentice Hall) and from Blackwell's Book Services, an arrangement that allows for the simultaneous purchase of titles from a wide array of vendors. Faculty and student suggestions are encouraged.

With over 22,000 titles (not included in the total above), e-books are an integral part of the UOIT library collection. Amongst the titles most likely to interest the Program's students and faculty are: *Access Science, Encyclopedia of Materials Science and Technology,* and titles included in both *Springer's* Engineering collection and *CRC's* Engineering and Chemistry packages *(EngNetbase, ChemNetbase, ChemLibNetbase).* Given UOIT's commitment to the laptop university concept, the Library's e-book collection will continue to grow.

Journals, Transactions and Conference Proceedings:

In addition to the indexing and abstracting tools that the Library provides for 100,000 periodicals (journals, magazines, newspapers) through its electronic databases, 35,000 of these titles are available in full text electronically and 400 in paper. Approximately 2,000 are engineering journals and 4,250 are science journals that provide supporting mathematical, physical, chemical and biological information. The Library provides the electronic version of a journal in lieu of the paper copy thus providing access for a greater number of patrons both on and off campus. As well, the Library makes every attempt to obtain archival issues of key journals in electronic format. It is, however, realized that older issues are not always available online. Several gifts of archival volumes have already been received and the Library will continue to actively pursue and encourage specific journal donations. Many electronic databases also offer indexing and/or the full text for technical reports, conference proceedings and standards.

UOIT library databases supporting this postgraduate program are categorized and then listed alphabetically below.

Extremely Relevant:

ASTM Digital Library
Compendex
CCOHS (Canadian Centre for Occupational Health and Safety) +
E-Journals @Scholars Portal *
IEEE (Institute of Electrical and Electronics Engineers)
INIS (International Nuclear Information System)
Inspec (IEE- Institution of Electrical Engineers)
Science Citation Index Expanded (Part of ISI Web of Science)
Scopus

Very Relevant:
ACS (American Chemical Society)
BioOne^
Biosis^
IOP (Institute of Physics)
MathSciNet
Proquest Science
PubMed^
RSC (Royal Society of Chemistry)
Scitation (AIP – American Institute of Physics)
SPIE (Society for Optical Engineering)
Wilson Applied Science & Technology Abstracts

Relevant (multidisciplinary databases):
Academic Search Premier
Academic OneFile
JStor

+includes MSDS (Material Safety Data Sheets) and associated Ontario and federal legislation and standards

*journal offerings from numerous vendors including Elsevier (Science Direct), Wiley, Springer, Blackwell, Cambridge searchable through a single interface

^of particular interest to those enrolled in the Radiation and Health Physics stream

In addition, UOIT postgraduate students are directed to *JCR (Journal Citation Reports)*, a database that ranks journals by impact factor and indicates which journals are most frequently cited in each field; *PQDT (Proquest Dissertations and Theses)*; and *Theses Canada Portal*. Along with numerous other nuclear journals from noteworthy publishers, the UOIT Library provides access to the top 15 English language journals in the JCR Nuclear Science & Technology subject category (*Annals of Nuclear Energy, Applied Radiation & Isotopes, Fusion Engineering & Design, Fusion Science & Technology, Health Physics, IEEE Transactions on Nuclear Science, International Journal of Radiation Biology, Journal of Fusion Energy, Journal of Nuclear Materials, Journal of Radiological Protection, Nuclear Instruments & Methods in Physics Research: Section A, Nuclear Instruments & Methods in Physics Research: Section B,*

Nuclear Science & Engineering, Radiation Measurements, Radiation Physics & Chemistry). When a key journal is not available through a database package, the Library negotiates directly with the publisher for title-by-title access. This has been the case for journals issued by ASME (American Society of Mechanical Engineering), ANS (American Nuclear Society) and Oxford's *Radiation Protection & Dosimetry.* As described below, the library maintains a searchable online alphabetical listing of all its periodical titles. These singularly acquired journals are included here as are all the full text journal titles from every UOIT Library database.

Please note that there are several ways to access electronic journals. UOIT is a member of both OCUL (Ontario Council of University Libraries) and CRKN (Canadian Research Knowledge Network) – the provincial and national university library consortia, respectively, that provide for the effective group purchase and distribution of electronic resources. Scholars Portal and E-Journals at Scholars Portal are OCUL platforms that allow an individual to access a number of databases simultaneously. The UOIT Library also provides subject guides highlighting pertinent indexes and databases, a searchable alphabetical list of all indexes and databases, a searchable alphabetical list of all periodical (journal, magazine and newspaper) titles, and a citation locator that checks for either journal or article availability. Further, cross-referencing amongst databases is provided by a federated search engine or linking software called "Find It @ UOIT". If a patron is searching one database, but the article is available in another, he/she will be redirected to this resource. If the article is not available at UOIT, the option to request an ILL (interlibrary loan) is displayed.

The Library also hosts Refworks, a software tool that allows for citations to be "harvested" from various periodical databases or imported directly so bibliographies can be easily prepared. The user selects the appropriate bibliographic format (e.g. MLA, APA) and Refworks applies it to the references that have been assimilated. The complementary component is Refshare; it allows for bibliographies to be shared amongst colleagues and/or to be used as electronic reserve listings. Students are directed to an article by their professor and simply authenticate into the Library system.

Internet:

While the prevalence and importance of the Internet is recognized, it is also realized that not all information on the Internet is of equal value and/or prominence, and that not all people have equal search skills. The Library, therefore, strives to make staff and students aware of quality web sites appropriate to their Program. Listings of Recommended Web Sites are part of the Library Subject Guides that are prepared with each UOIT program in mind. Available through the Library web site www.uoit.ca/library, these Guides are discussed in detail under "Accessibility". For example, relevant sites posted within the Nuclear Subject Guide include: CNSC (Canadian Nuclear Safety Commission), CanREN (Canadian Renewable Energy Network), AECL (Atomic Energy of Canada Limited), Canadian Nuclear FAQ, IEA (International Energy Agency) and RadWaste. On the general Engineering Subject Guide, faculty and students are directed to web sites such as: EEVL (Edinburgh Engineering Virtual Library – Heriot Watt University), efunda (Engineering Fundamentals), Project Euclid (Cornell University), Scirus (Elsevier), IEEE (Insitute of Electrical an Electronic Engineers) and IEE (Institute of Electrical Engineers).

Data Sets:

DLI (Data Liberation Initiative) is an expansive collection of detailed statistical sets assimilated and maintained by Statistics Canada and offered through the IDLS (Internet Data Library

System) hosted by the University of Western Ontario's Social Science Computing Laboratory. ICPSR (Inter-University Consortium for Political and Social Research) is the international equivalent and is hosted by the University of Michigan. Those files that relate to manufacturing, the environment and associated health issues will be of interest to researchers in the Nuclear Engineering masters program.

D-Space:

As noted in the Introduction, D-Space is the host platform for the indexing and abstracting of the Library's Special Nuclear Collection. The actual physical and complete documents are stored in the Library's Special Collection Room. D-Space is an open archive initiative (OAI) developed by the Massachusetts Institute of Technology (MIT) that allows for the capturing, storing, indexing, preserving and distributing of digital research material. Its creators intended D-Space to be an online platform for collaboration amongst colleagues. The UOIT Library therefore plans to launch a version of D-Space that invites Faculty members to post their research findings and papers in an institutional repository.

Accessibility:

The Building:

The new state-of-the-art, 73,000 square foot Library was opened in August 2004. The intent of the design was to create a print/electronic library that accommodates new and emerging technologies without sacrificing the personal warmth of a traditional library. The building offers various types of study and activity spaces to accommodate different learning styles and user needs. Noteworthy features include:

- 500 seats
- 11 group study rooms
- 2 library orientation classrooms
- Silent study and special collections room
- 2 floor round reading room with fireplace
- 160 public computers – wired and wireless
- Photocopier and printer stations on each floor
- Special needs adaptive technology equipment

Over the 2005-2006 academic year, library visits have increased by approximately 35%. there are plans for a fourth floor expansion and the architects have incorporated a "footprint" to the north to eventually double the library's size.

ON CAMPUS REFERENCE ASSISTANCE:

Reference services are provided by professional librarians for 68 hours of the 89 hours per week that the Library is physically open or 76.5% of the time. Librarians liaise with professors so classes specific to student research topics can be offered, and general information literacy sessions are offered campus-wide throughout the year. Topics such as the research process, Internet site evaluation, and bibliographic citation are addressed. Individual or small group appointments with a librarian are encouraged too.

Library Web Page:
The Library web page is available at www.uoit.ca/library and is accessible 24 hours a day, seven days a week. Both a general Library e-mail address and a Reference Desk e-mail are provided as well as telephone information so individuals can leave messages at any time. The Library is also a participant in Knowledge Ontario, a province wide initiative aimed at delivering quality reference resources and services to all citizens. The Virtual Reference Desk component called Ask Ontario is scheduled for launch in 2008. Chat software is used to instantaneously ask and answer reference questions regardless of time and location; this technology promises to be more effective than e-mail and telephone. Beginning with limited hours and an after-hours e-mail default, the ultimate goal is to make virtual reference a "round the clock" service.

General reference assistance is provided through Library web page sections that explain topics such as computer search techniques, article searching, internet evaluation, and bibliographic citation. Amongst the services outlined are circulation procedures, reserves, and interlibrary loan.

The web page's Subject Guides are both directional and informative. Prepared with each UOIT program in mind, each guide highlights discipline specific books, e-books, periodical indexes and additional electronic resources (e.g. websites). Depending on the subject, there may be links to statistics and data, government information, legislation and legal cases. A "Special Notes for this Subject" section also appears at the beginning of each guide, if the researcher needs to be aware of unique holdings (e.g. special nuclear collection), help sheets, facilities, loan periods, etc.

Interlibrary Loan and Document Delivery:

Interlibrary Loan is currently provided free of charge to students, staff and faculty. Individuals have the option of making their requests online or in person. RACER (rapid access to collections by electronic requesting) is a VDX (Virtual Document Exchange) interlibrary loan system implemented in OCUL member libraries. Searches are performed throughout all Ontario university libraries and CISTI (Canada Institute for Scientific and Technical Information). As part of OCUL and the IUTS (Inter University Transit System), the Library now receives book loans in a very reasonable amount of time, and Ariel, an electronic transmission system for periodical articles, allows journal requests to be filled within a few days.

Faculty and students from UOIT may also visit any of Canada's university libraries and may borrow books (Reciprocal Borrowing Agreement) directly from them upon presentation of their UOIT photo identification card. Materials may be returned directly to the lending library or may be left at the UOIT Library where they will be returned to the appropriate lending library.

The Library is indeed preparing for the University of Ontario Institute of Technology's initial postgraduate degree offerings, and lends its support to the resource and research needs of both faculty and students.

CM
February 9, 2007

Appendix B:

General Policies and Procedures for Graduate Studies at the University of Ontario Institute of Technology

Approved by UOIT Academic Council - June 1, 2006

Note: For OCGS, the Graduate Policies and Procedures will be included in their entirety in this Appendix. Those involved in the internal review of the proposal are asked to refer to the following website link:

http://www.uoit.ca/EN/main2/about/13525/14057/14152/gradpolicies.html