

# FACULTY OF ENGINEERING AND APPLIED SCIENCE



[www.engineering.uoit.ca](http://www.engineering.uoit.ca)

# Engineering at UOIT

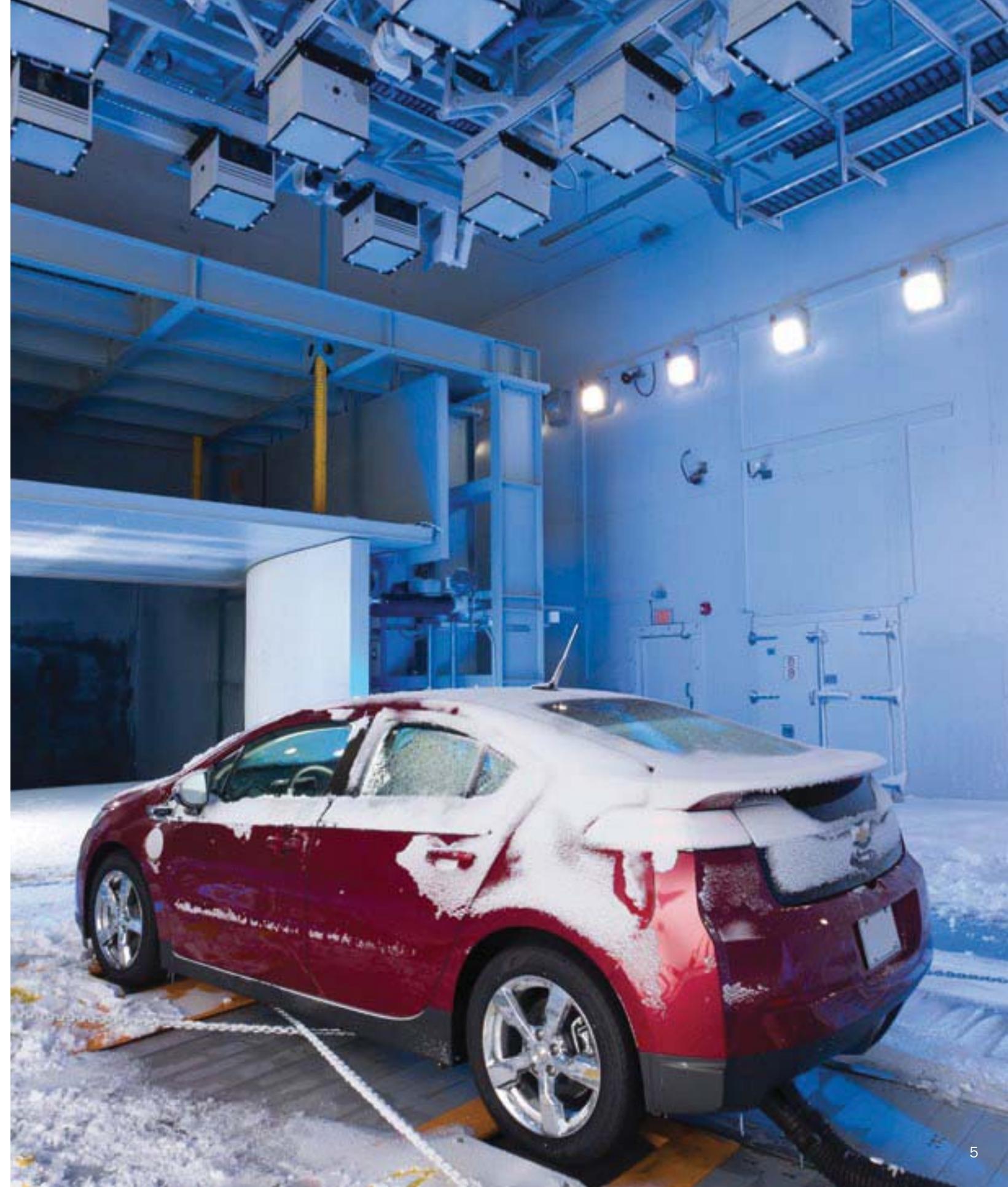
The Faculty of Engineering and Applied Science (FEAS) has developed innovative programs that will prepare you to succeed as a professional engineer. Our highly-engaged, world-class professors will teach you how to look at things with an engineering eye and acquire problem-solving skills that will set you apart and give you a competitive advantage when you graduate.

Each of our programs is designed to address both your educational needs and the market-driven requirements of employers. Our growing national reputation for research excellence is reflected in the fact that you, as an undergraduate student, will have the opportunity to work on groundbreaking research projects supervised directly by professors with associated expertise.

You will work on team projects, learn to communicate clearly and graduate with the flexible and transferable skills essential for today's workplace. Engineering design principles are integrated throughout each program, culminating in a fourth-year Capstone project that will provide you with the opportunity to synthesize what you have learned as a member of a small student team tackling real-world research problems in collaboration with a faculty member.

## UOIT IS...

- An award-winning campus located less than an hour's drive east of Toronto;
- A university offering exceptional, cutting-edge facilities, including the one-of-a-kind General Motors of Canada Automotive Centre of Excellence and the new 9,290-square-metre Energy Research Centre (ERC);
- Home to Canada's only degree programs in Automotive Engineering and Manufacturing Engineering and offers an Engineering and Management (five-year) option for all programs;
- Dedicated to helping you obtain outstanding internship opportunities with leading employers; and
- Engaged, providing extracurricular opportunities for hands-on research and participation at national- and international-level university competitions.



# A solid foundation: UOIT's first-year common core

All first-year engineering students start with a common program of study. You will gain an in-depth understanding of mathematics, physics, chemistry, computing and technical communications, which form the foundation of all engineering disciplines. You will also have an opportunity to learn about the various programs available, providing an opportunity to select a different engineering discipline should you discover a new program preference once you have started your studies.

Common core program courses include:

- Engineering Graphics and Design;
- Environmental Science;
- Impact of Science and Technology on Society;
- Introduction to Programming for Engineers; and
- Technical Communications.

*"I have been involved in undergraduate research as the recipient of a Natural Sciences and Engineering Research Council of Canada research assistantship and with the EcoCAR team, which promotes research in alternative vehicle technologies."*

– Samantha Hazell, Electrical Engineering, class of 2010

## Automotive Engineering

[www.engineering.uoit.ca/undergraduate/automotive](http://www.engineering.uoit.ca/undergraduate/automotive)

The Automotive Engineering program is poised to meet the challenges associated with reshaping North America's most important industrial sector. The urgent need for advancements in transportation systems is accelerating the research and development opportunities for alternative technologies such as electric and fuel cell-driven vehicles. The cars, planes, motorcycles and trucks of tomorrow will be clean, green and transformative – and designed by automotive engineers being trained today.

The first of its kind in Canada, UOIT's Automotive Engineering program takes a multidisciplinary approach, combining a central focus on mechanical engineering with elements of manufacturing and electrical engineering. Based on this philosophy, the program has a course roster that covers a broad range of topics.

Program courses include:

- Automotive Component Design;
- Automotive Engineering;
- Automotive Structural Design and Material;
- Combustion and Engines; and
- Vehicle Dynamics and Control.



## Manufacturing Engineering

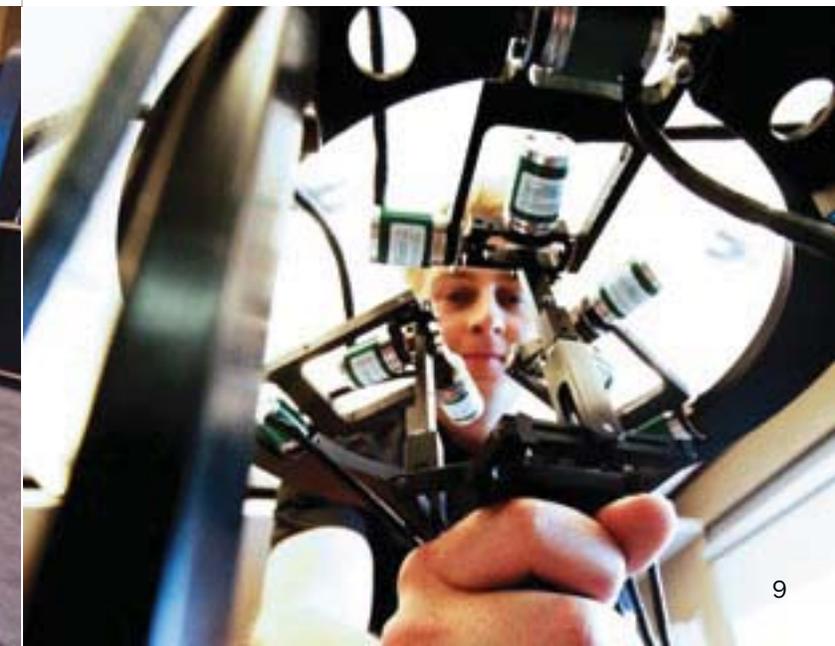
[www.engineering.uoit.ca/undergraduate/manufacturing](http://www.engineering.uoit.ca/undergraduate/manufacturing)

Two million Canadians work in the Canadian manufacturing sector, and the need for innovative approaches to developing a strong manufacturing base continues to grow. UOIT's Manufacturing Engineering program is the only such accredited program in Canada. Although the sector is facing many challenges, by the time you graduate you will be well-positioned to lead and leverage the recovery.

As a student in the Manufacturing Engineering program you will be exposed to the design and improvement of high-tech systems for the production and manufacturing of products. This includes the development and application of advanced technologies such as robotics, automation, new materials and intelligent controls. This interdisciplinary program involves working with other engineers to help find ways to bring designs to fruition, taking into account factors such as cost, quality, reliability and appearance.

Program courses include:

- Industrial Ergonomics;
- Manufacturing and Production Processes;
- Modelling Manufacturing Systems;
- Quality Control;
- Reliability and Maintenance;
- Robotics and Automation; and
- Structure and Properties of Materials.





# Mechanical Engineering

[www.engineering.uoit.ca/undergraduate/mechanical](http://www.engineering.uoit.ca/undergraduate/mechanical)

Mechanical engineering is the most interdisciplinary field of engineering, overlapping with electrical, chemical, civil, computer and software engineering to name just a few disciplines.

As a Mechanical Engineering student you will have the choice of three educational streams:

- Comprehensive option;
- Energy Engineering option; and
- Mechatronics option.

The first two years are almost entirely common for all routes through the Mechanical Engineering program. In the final two years, you will focus on your area of specialization.

## COMPREHENSIVE OPTION

The comprehensive option offers exposure to the full breadth of Mechanical Engineering. Graduates will be well-positioned to find employment in a variety of industries including:

- Automotive;
- Dynamics and vibrations;
- Energy and environmental systems;
- Heating, ventilation and air-conditioning;
- Machines and mechanisms;
- Prime movers, robotics and automation;
- Telecommunications; and
- Transportation.

Program courses include:

- Advanced Solid Mechanics and Stress Analysis;
- Computer-Aided Design;
- Kinematics and Dynamics of Machines;
- Machine Design;
- Mechanical Vibrations;
- Mechatronics; and
- Thermodynamics.

## ENERGY ENGINEERING OPTION

A strong, vibrant economy requires responsible energy management. Energy engineering increasingly focuses on the efficient and environmentally benign use of energy systems, as well as energy security and reliability.

In the Energy option of Mechanical Engineering, students specialize in all aspects of energy, from its generation to its end use, including energy conversion, storage, transportation and distribution.

Program courses include:

- Applied Thermal and Fluids Engineering;
- Fossil Fuel Energy;
- Sustainable and Alternative Energy Technologies;
- Thermal Environmental Engineering; and
- Thermofluids and Energy Systems Design.

## MECHATRONICS ENGINEERING OPTION

Mechatronics engineering involves the design and application of intelligent, computer-controlled electromechanical systems. It facilitates the development of products and processes with significantly enhanced function and performance.

This specialization exposes students to the integration of electronics and mechanical systems using automated and intelligent computer-control systems to produce new devices such as artificial hearts, anti-lock braking systems and micro-electromechanical systems (MEMS and nanotechnology).

Program courses include:

- Circuit Design;
- Control Systems;
- Mechatronic Systems Design;
- Microprocessors; and
- Robotics and Automation.



# Electrical Engineering

[www.engineering.uoit.ca/undergraduate/electrical](http://www.engineering.uoit.ca/undergraduate/electrical)

Electrical engineering plays a critical role in both the Ontario and Canadian economy and is continually advancing and giving rise to new opportunities and challenges. Developed in consultation with industry, the Electrical Engineering curriculum provides a solid grounding in fundamentals, with significant content in engineering sciences and engineering design.

Our program focuses on the design and manufacturing of electrical and computer technologies and their component parts, as well as the integration of electrical components into complex systems. Graduates are prepared to find innovative solutions that lead to rapid advances in technology that are intrinsic to the electrical and computer industry sectors. These sectors include but are not limited to: computers, electronics, telecommunications, wireless communications, control systems and power transmission, such as the integration of power provided by renewable energy systems so blackouts can be avoided.

Electrical engineering is continually exploring new opportunities and challenges that include more advanced telecommunications networks (wireless communications and the Internet), more powerful computers with increased memory and computing power which can then be provided at a lower cost, and the application of complex controls to interdisciplinary systems, such as automotive control systems. Challenges on the horizon include determining how to use technology to tackle societal and environmental needs, such as the environmentally urgent requirement for efficient, long-range electric vehicles.

Program courses include:

- Digital Signal Processing Theory and Design;
- Electrical Engineering Systems Design;
- Electromagnetics;
- Electronic Circuit Design;
- Modern Control Systems;
- Power Systems; and
- Wireless Communications.

# Software Engineering

[www.engineering.uoit.ca/undergraduate/software](http://www.engineering.uoit.ca/undergraduate/software)

The Software Engineering program at UOIT provides intensive exposure to the engineering challenges associated with the development and utilization of computer software. This elite program also addresses the design of computers, computer science, integration of software into computer systems and the applications of software systems.

Demand for software engineers to meet emerging needs continues with increased technology advancement and new software being introduced to consumers, businesses and industry on a global scale.

The range of software engineering applications is growing. From special-effects software for the movie industry, through to software controlling devices such as digital cameras and robots, and software that drives businesses and the financial sector, new opportunities and challenges are being created all the time.

Program courses include:

- Design and Analysis of Algorithms;
- Distributed Systems;
- Computer Networks;
- Introduction to Artificial Intelligence;
- Operating Systems;
- Software Design and Architectures; and
- Software Project Management.

*"I love the small class sizes and knowing the professors. UOIT also had a spin on the Engineering program I didn't see anywhere else: focusing on the alternative energies, which is what I'm interested in."*

– Janelle MacDougall, Mechanical Engineering, class of 2011



# Engineering and management: take your degree to the next level

To meet the growing need for engineers with the leadership ability to succeed in a business environment, our programs offer an innovative management option. You can choose to complement the technical studies of your engineering program with business and management courses by opting for a five-year Bachelor of Engineering and Management program.

Program courses include:

- Engineering Operations and Project Management;
- Finance;
- Financial and Managerial Accounting;
- Marketing; and
- Organizational Behaviour and Management of Human Resources.

You will complete the first three years of your engineering program followed by a specialized Business and Management year. In the fifth and final year you will finish your Engineering program, while incorporating aspects of the knowledge gained during your Business and Management year.

If you are interested in applying to a five-year Engineering and Management program, you are first required to apply to the Engineering program that you wish to pursue. Once accepted, you can apply to enrol in the Engineering and Management option.

# Graduate Studies

[www.gradstudies.uoit.ca](http://www.gradstudies.uoit.ca)

If you wish to continue your studies after completing your undergraduate degree at UOIT, we offer several graduate programs and will continue to introduce new graduate engineering opportunities.

UOIT presently offers the following graduate programs:

## MASTER OF APPLIED SCIENCE (MAsc) AND MASTER OF ENGINEERING (MEng) IN:

- Automotive Engineering;
- Electrical and Computer Engineering; and
- Mechanical Engineering.

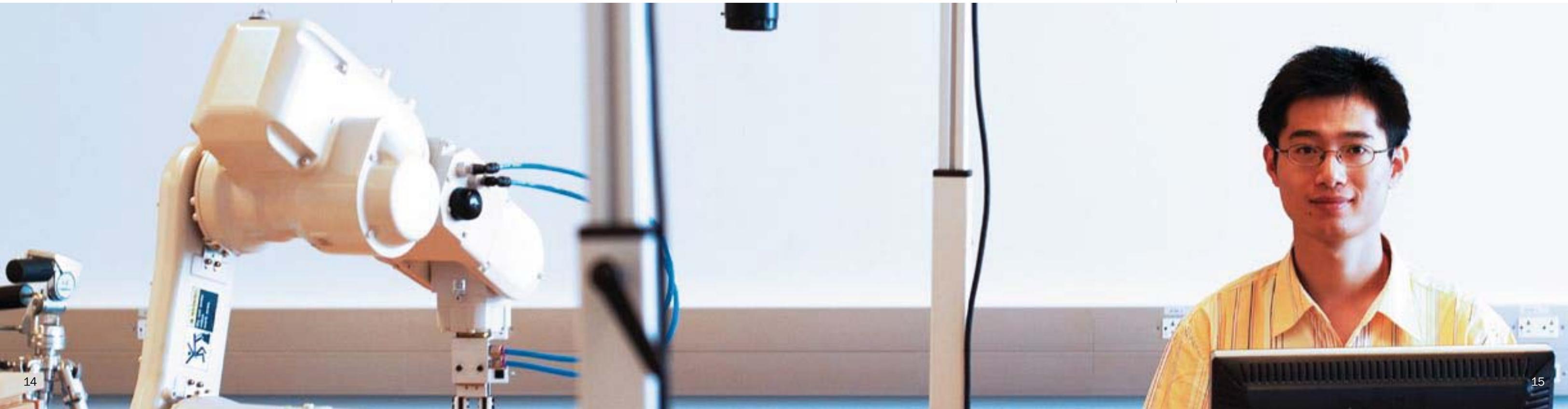
## MASTER OF ENGINEERING MANAGEMENT (MEngM)\*

## DOCTOR OF PHILOSOPHY (PHD) IN:

- Electrical and Computer Engineering; and
- Mechanical Engineering.

## GRADUATE DIPLOMA (GDIP) IN ENGINEERING MANAGEMENT\*

\*At the time of printing, these programs were pending approval by the Ontario Council of Graduate Studies.



# Hands-on experience: your competitive advantage

Research opportunities for undergraduate students are a key differentiator between UOIT and traditional higher-learning institutions.

Our faculty members are eager to provide you with opportunities to undertake research projects and understand that hands-on experience will give you an edge in getting a job or pursuing graduate studies and research careers. Student-faculty research collaboration happens at UOIT on an ongoing basis and this unique one-on-one model is an important part of our student experience.

Getting involved with a vehicle team is a popular choice for UOIT engineering students, giving them an opportunity to collaborate, design, build and test next-generation vehicles, in many cases against engineers from other leading universities.

## CAPSTONE PROJECTS

In Capstone and thesis projects, students tackle a specific research question in their subject area and complete a formal report, applying previous undergraduate studies to a practical, hands-on project, often based on a real-world problem or question. In addition to the written report, findings are also presented to faculty, classmates, higher academic groups and/or clients.

### POOL/DECK LIFT SYSTEM

Partnering with Enable Industries of Ogden, Utah, six engineering students developed a lift mechanism for the disabled for use at either a dock or a pool for their 2010 Capstone project. A similar product does not exist in the market, and furthermore, the students' design meets the guidelines and standards of Americans with Disabilities Act (ADA).

The system's adjustable arm and telescopic boom can be powered by battery pack or electrical outlet and features a 360-degree powered rotation in either direction, the ability to clear 75 cm walls/obstructions and a light-weight aluminum design that supports up to 225 kg. The 100 per cent polyester mesh sling seat is strong and easily folded for storage and transport.

## INTERNSHIP OPPORTUNITIES

UOIT's strong partnerships provide students with outstanding optional, paid internship and placement opportunities. This real-world experience with leading employers will allow you to gain a competitive edge upon graduation and develop engineering and business skills that will in turn enhance your:

- Confidence level;
- Understanding of the role of engineering; and
- Marketability to future employers.

Students who participate in our internship programs can accumulate credit up to 12 months towards their professional engineer designation based on relevant working experience. The internship gives students the chance to handle complex, challenging work projects and be treated as employees within an organization. Most often, students find that their internship experience exceeds their expectations, resulting in conditional offers of employment upon graduation.

Internships are available after your third-year of studies and are 12 to 16 months in duration.

Students can also choose an intensive internship which offers you valuable practical hands-on experience enabling you to explore your career options in a two- to four-month placement that typically occurs during the summer months. If you choose to participate in one of our engineering placements, you can do so at any stage of your academic studies.

## INDUSTRY CONNECTIONS

Each of our innovative programs is created in collaboration with our strong industry partners. Our program content is current and you will graduate with the skills that today's employers demand.

Here's a sample of leading employers who recently provided internship opportunities for UOIT Engineering students:

- Aiolos;
- Bruce Power;
- Cameco Corporation;
- CAMI Automotive;
- Celestica;
- Canadian Nuclear Safety Commission;
- DDACE;
- General Dynamics Canada;
- General Electric;
- General Motors of Canada;
- Hydro One;
- IBM;
- Johnson Controls;
- Klenzoid;
- Linamar Corporation;
- Magna International;
- Messier-Dowty;
- Morrison Lamothe;
- Ontario Power Generation;
- Research in Motion;
- Roll Form Group; and
- Smurfit-MBI.

### FAST FACT

UOIT is officially recognized as an international contributor to the Partners for the Advancement of Collaborative Engineering Education (PACE), partnering with universities around the world and entities such as GM, Hewlett-Packard, Siemens, EDS and Sun Microsystems in order to compete in today's high-tech, global economy.



# Leading-edge learning environment

UOIT is a leader among North American universities in implementing and using course- and industry-specific software for mobile learning. You will receive a high-end laptop at the beginning of your studies and your professors also develop sophisticated course content using a powerful campus-wide online learning management system.

One of the greatest advantages of our Mobile Learning program ([www.uoit.ca/mobile](http://www.uoit.ca/mobile)) is that all students have equal access to the same technology, resources and services. UOIT's approach to technology-enhanced learning includes the use of smart classrooms that are equipped with data projectors, wireless access, electric drop plugs and the latest available lecture podiums.

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*"I like the fact that the university is new – it's a beautiful campus. And I like the fact that it is a laptop-based learning environment."*

– Shane Comella, Mechanical Engineering, class of 2012

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## ONTARIO POWER GENERATION (OPG) ENGINEERING BUILDING

The 3,700 square-metre, three-storey OPG Engineering building includes 17 laboratories designed to give you the latest in hands-on skills. These state-of-the-art learning areas include a rapid prototyping and manufacturing lab, a combustion and engines lab, a mechatronics and robotics lab and an emerging energy systems lab with solar, wind, hydrogen and fuel-cell technology.

## ENERGY RESEARCH CENTRE (ERC)

Opened in 2011, the ERC enables leading-edge study and research into clean and green energies and technologies needed to sustain the planet and promote Canada's entrepreneurial advantage through public-private research and commercialization partnerships. UOIT is strategically located in Durham Region, Ontario's energy capital. The ERC houses UOIT's unique-in-Canada energy science and engineering programs, including courses in wind, solar, hydrogen, hydraulic, geothermal natural gas and nuclear energy.

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### FAST FACT

UOIT's Clean Energy Research Lab will produce five kilograms of nuclear hydrogen daily and also house innovative research in multi-phase flow, heat transfer, electrical and nanotechnologies and solar thermal water splitting.

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## GENERAL MOTORS OF CANADA AUTOMOTIVE CENTRE OF EXCELLENCE (ACE)

Our students have the opportunity to be part of automotive history – playing a key role in the reinvention of the automotive manufacturing sector. Automotive Engineering students have access to the ACE, an innovative, world-class testing centre for research and development focused on automotive manufacturing and industrial applications.

ACE is equipped with one-of-a-kind features including a climatic wind tunnel that is sized to accommodate cars, buses, trucks, trains and airplane wings. This 13,560 square-metre facility will support automotive-related undergraduate and graduate teaching, and collaborative and industry-sponsored research.

## INTEGRATED MANUFACTURING CENTRE

Our Integrated Manufacturing Centre is a fully automated, industrial-grade, flexible, manufacturing facility capable of fabricating and assembling a wide range of products from raw materials. Students use advanced technologies to create fully functional, automated work cells, which they can integrate and program in robotic assembly facilities.

## CLEAN ENERGY RESEARCH LABORATORY (CERL)

CERL is a cutting-edge research facility unlike any other in the world. CERL houses the first lab-scale demonstration of a copper-chlorine cycle for thermo chemical water splitting and nuclear hydrogen production. Hydrogen is a clean energy carrier of the future and potentially a major solution to the problem of climate change.



# Challenge yourself outside the classroom

There are dozens of campus clubs, including faculty-related groups such as:

- Engineers Without Borders;
- The Institute of Electrical and Electronics Engineers (IEEE) Student Chapter;
- The IEEE Engineering in Medicine and Biology Society Club;
- The National Society of Black Engineers; and
- Women in Engineering.

We even offer a Co-curricular Recognition program that supports and recognizes your participation and leadership in campus activities. Leadership awards and recognition ceremonies are held for graduating students in the spring.

UOIT Engineering students continue to demonstrate that they are a cut above, participating in on-campus design competitions as well as regional, national and international events and a number of vehicle team challenges.

*“Through UOIT Motorsports, we’ve been challenged to push the boundaries of our thinking and learning at UOIT. The hands-on skills we’ve learned in our engineering courses will hopefully set us apart from the competition.”*

– Sam Ashtiani, Automotive Engineering, class of 2010. Ashtiani, with fellow graduates Shane Viccary and Jonathon Rolstin, launched the auto racing team AVR Motorsports.



## EXTERNAL DESIGN COMPETITIONS

As a UOIT Engineering student, there are plenty of opportunities to get involved in external design competitions that bring together engineering students from a variety of other educational institutions.

Here are a few examples of the extraordinary accomplishments our engineering students have achieved:

### ONTARIO CENTRES OF EXCELLENCE

- 2011 finalist – Best Connections Project; and
- 2010 first place – Best Connections Project.

### ONTARIO ENGINEERING COMPETITION

- 2009 first place – Senior Design Competition;
- 2007 first place – Junior Design Competition;
- 2007 third place – Senior Design Competition; and
- 2006 third place – Junior Design Competition.

### CANADIAN ENGINEERING COMPETITION

- 2009 third place – Senior Design Competition.

### FORMULA SAE WEST COMPETITION

- William C. Mitchell Rookie Award – Best finish for a first-year team (2007); and
- Second-best Canadian team overall (2007).

#### FAST FACT

The core research facility in the Automotive Centre of Excellence facility features a climatic wind tunnel capable of wind speeds in excess of 240 km/h, temperatures ranging from – 40 C to 60 C and the ability to create humidity from five to 95 per cent. The tunnel is capable of simulating extreme conditions such as driving a car up a steep mountain road in dry desert heat or through the middle of an arctic blizzard.

## UOIT MOTORSPORTS

[www.uoitmotorsports.com](http://www.uoitmotorsports.com)

The Faculty of Engineering and Applied Science continues to earn high praise and awards through UOIT Motorsports – the Formula Society of Automotive Engineers (SAE) auto racing team. In 2009, UOIT competed against 79 other universities at an international SAE event at the California Speedway, and ranked in the top half of all entries, and second among the nine Canadian teams.

In 2010, the team won top honours in the province at the prestigious Ontario Centres of Excellence (OCE) Discovery Showcase in Toronto. The automotive engineers designed and built a scaled-down Formula style car that helped them capture top prize in the Best Connections Project (university level) at OCE for outstanding collaboration with industry partners Multimatic Technical Solutions Inc. of Markham, Ontario and Durmach Tool and Die of Bowmanville, Ontario.

## OMEGA SOLAR

[www.omegasolar.ca](http://www.omegasolar.ca)

Founded by a UOIT Manufacturing Engineering student, Omega Solar is student-run solar car racing team comprised of UOIT engineering students who partner with students from the School of Applied Sciences at Durham College. Rayce is the term used to describe solar car races. The team’s first solar vehicle is being readied for the World Solar Challenge in Australia.



# Admission requirements

## FAST FACTS

UOIT is home to North America's second largest geothermal well field, which uses a ground-source heat recovery system to heat and cool university buildings.

Applicants must present at minimum an Ontario Secondary School Diploma (or equivalent) with a minimum of six 4U or 4M credits, including:

- English (ENG4U);
- Advanced Functions (MHF4U);
- Calculus and Vectors (MCV4U);
- Chemistry (SCH4U); and
- Physics (SPH4U).

In addition, a combined minimum average of 70 per cent in math and science courses is required.

Student selection is determined through consideration of a wide range of criteria including school marks, distribution of subjects taken and performance in subjects relevant to the academic program. The specific average or standing required for admission varies from year to year. Possession of minimum requirements does not guarantee acceptance. Preference will be given to applicants with the best qualifications.

For complete information on the current admission requirements to UOIT undergraduate programs, please visit [www.uoit.ca/programs](http://www.uoit.ca/programs).

# Financing your education

[www.uoit.ca/safa](http://www.uoit.ca/safa)

Because your education is one of the most important investments you'll ever make, our Student Awards and Financial Aid (SAFA) office works hard to ensure you have everything you need to meet your financial obligations. We are committed to helping you with the financial aspect of your post-secondary experience and encourage you to take advantage of the Ontario Student Assistance Program (OSAP), budget counselling and on-campus and summer employment opportunities to help offset the cost of your tuition, books and other fees.

We offer a variety of scholarship awards and bursaries to help you meet the cost of a university education. Engineering faculty scholarships are awarded to selected Ontario secondary school students who are admitted to UOIT and possess an outstanding admissions average. Thanks to the generosity of donors, there are also a variety of other student awards available if you are in financial need and in good academic standing.

OSAP and the Canada Student Loans program will also provide financial assistance if you qualify.

# FACULTY OF ENERGY SYSTEMS AND NUCLEAR SCIENCE



[www.nuclear.uoit.ca](http://www.nuclear.uoit.ca)

# Welcome from the dean



Welcome to the Faculty of Energy Systems and Nuclear Science (FESNS) at the University of Ontario Institute of Technology (UOIT)!

Energy systems and nuclear science is a truly exciting area of study, presenting significant employment opportunities in a variety of fields for engineers and scientists possessing knowledge of the safe, efficient generation and use of energy, including fossil, nuclear, wind and solar technology. In addition, UOIT's location is particularly advantageous to this area of study as the surrounding Durham Region features 10 operating nuclear generating units and a variety of companies in the energy business. All of this means UOIT is the ideal choice if you have an interest in energy and a passion for pursuing a rewarding and challenging career.

You can choose from five degree programs: Bachelor of Engineering in Nuclear Engineering, Bachelor of Engineering in Energy Systems Engineering, Bachelor of Science in Health Physics and Radiation Science and Bachelor of Applied Science in Nuclear Power, as well as the five-year Bachelor of Engineering Management degree. We also offer Master's and PhD degree programs in Nuclear Engineering in the fields of Nuclear Power and Radiological Health Physics. In May 2011, a new bridge program was added for eligible Ontario college students to complete a Bachelor of Applied Science in Nuclear Power degree, and the faculty will soon offer a Master of Business Administration (MBA) option.

During your studies, you will conduct innovative research, analyze data and apply theoretical knowledge to real-life situations preparing you to successfully enter the workforce in this growing and important industry sector. Our world-class professors are experts in their fields and will challenge and inspire you to push your own boundaries of thinking and learning, and to experience a variety of personal growth and learning opportunities.

In the pages that follow, you will find additional information about what our faculty has to offer and how it can prepare you for your future career. I also encourage you to consult our website, [www.nuclear.uoit.ca](http://www.nuclear.uoit.ca).

Best wishes,

**Dr. George Bereznai**  
Dean, Faculty of Energy Systems and Nuclear Science



# Bachelor of Science (Honours) in Health Physics and Radiation Science

In this age of advanced technological development, it is difficult to find an aspect of our modern life that does not involve the use of ionizing radiation. Energy supply, medicine, agriculture, national security, manufacturing and resource-based industries are all examples of where the uses of radioactive materials or radiation-generating machines are an essential part of their operations. Radiation is also a unique tool for the study of materials and matter on the atomic scale. Radiation science recently has seen huge advances in techniques for material science using advanced radiation sources such as synchrotrons, neutron spallation sources and reactor neutron beams.

Such a wide-spread and general application of radiation leads to a constant and growing demand for trained scientists who understand radiation, its applications and hazards, and can work towards the betterment of society through its safe and innovative use.

The curriculum is a combination of fundamental radiation science, technological methods and applications allowing graduates to confidently seek rewarding careers in the above-mentioned sectors, along with many other fields of work. The number of university programs in the area of Health Physics and Radiation Science in Canada are limited and as an undergraduate in our program, you will become a member of a very specialized and select group, increasing your competitive advantage and enhancing your appeal to major employers.

Included in the program are courses such as:

- Industrial Applications of Radiation Techniques;
- Introduction to Nuclear Reactor Technology;
- Medical Imaging;
- Radiation Biophysics and Dosimetry;
- Radiation Detection and Measurement;
- Radiological and Health Physics; and
- Therapeutic Applications of Radiation Techniques.

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*“My undergraduate degree gave me a good foundation to pursue a career in the industry or to choose a graduate program. My success is largely due to the small class sizes which allowed for focused attention from amazing professors who care about my success. The program also gave me the opportunity to work with software typically used in the industry, which is an enormous asset in today’s technology-driven workforce.”*

- Ashita Kumar, Health Physics and Radiation Science graduate, class of 2010

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# Bachelor of Engineering (Honours) in Energy Systems Engineering

With each passing day, the worldwide demand for energy increases. New sources of energy, new methods of energy conversion, transportation and storage, and improved efficiencies in existing energy systems are desperately needed. As an energy systems engineer, you will play a major role in meeting the world’s needs while protecting the environment for many years to come.

UOIT’s Energy Systems Engineering program is the first stand-alone program of its kind in Canada. This degree was specifically designed to give you the skills you need to succeed in this dynamic field of study. You will examine and study all forms of energy including nuclear, solar, wind, hydro, hydraulic and fossil fuels, as well as more recent developments in hydrogen and fuel cell technologies. This program will enable students to generate complete system designs from small-scale devices to large-scale systems and to communicate effectively with other engineers.

Graduates of this program will become part of an elite group of next-generation professionals responsible for developing sustainable solutions that energize our world. An exciting future in energy awaits you!

Included in the program are courses such as:

- Electric Power Systems;
- Emerging Energy Systems;
- Fossil Fuel Energy Conversion;
- Fuel Cell Design;
- Hydrogen Power Systems;
- Hydroelectric Power Systems;
- Nuclear Power Systems;
- Solar Energy Technologies; and
- Wind Energy Systems.

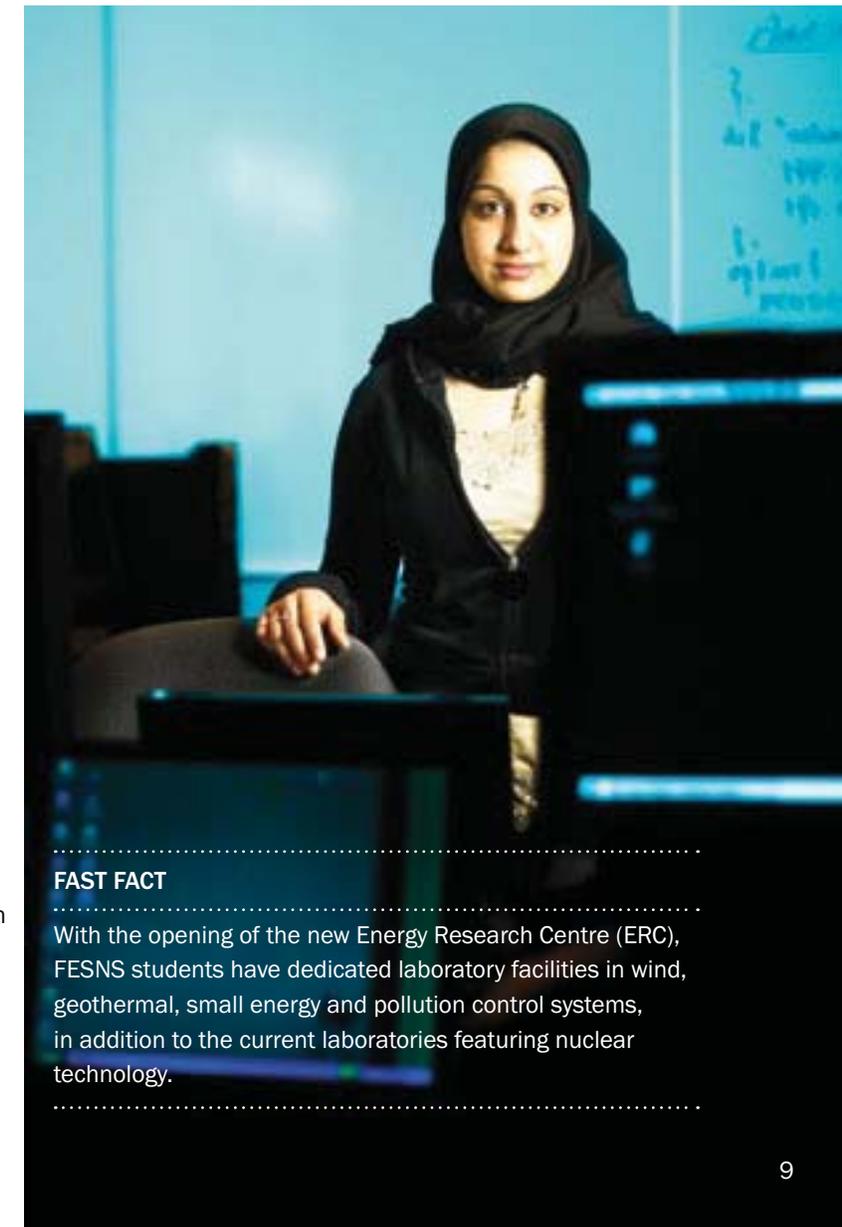
With one additional year of study, students can graduate with a bachelor of engineering and management. This five-year program enables students to study nuclear engineering or energy systems engineering at a management level and complement their engineering knowledge with solid accounting, finance, operations, human resources and marketing skills.

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*“I chose UOIT because it offered a unique program in Energy Systems Engineering that will allow me to understand sustainable energy production. I also enjoy the small class sizes and the laptop-based learning environment.”*

- Craig Robinson, Energy Systems Engineering student class of 2013

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#### FAST FACT

With the opening of the new Energy Research Centre (ERC), FESNS students have dedicated laboratory facilities in wind, geothermal, small energy and pollution control systems, in addition to the current laboratories featuring nuclear technology.

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# Bachelor of Engineering (Honours) in Nuclear Engineering

Ontario has a long history of nuclear activity. The province's first commercial reactor went into service over four decades ago, in 1971. Yet despite producing over 50 per cent of Ontario's energy, new reactors have not been built since 1983. This is about to change.

With construction of new reactors expected in the near future and an aging workforce, there is a great need for qualified employees to address the personnel shortage across the industry, from researchers to operators to regulators. In addition to the recent changes in the domestic industry, internationally there is a strong push for nuclear power with several countries in the Middle East, Africa and South East Asia considering nuclear power for the first time. Students graduating with a Nuclear Engineering degree are in high demand. UOIT is prepared to meet this demand by producing educated and highly-skilled graduates.

The nuclear engineering program at UOIT is designed to present all aspects of the nuclear fuel cycle: from mining to plant operation and finally waste management. Within this broad field, students will study courses ranging from nuclear plant chemistry, nuclear materials and heat transport and steam generation systems, to nuclear physics and plant design. Not only will students be examining the current operational fleet of reactors, but they will be applying their growing knowledge to the future generation of reactors (e.g., supercritical water reactors, fast reactors and fusion reactors).

The four-year program is structured to integrate laboratory courses, field trips and research projects with core course material in order to provide the maximum preparation for this exciting, challenging and essential field.

Included in the program are courses such as:

- Environmental Effects of Radiation;
- Nuclear Fuel Cycles;
- Nuclear Plant Operation, Design and Simulation;
- Nuclear Reactor Design;
- Nuclear Reactor Kinetics;
- Radiation Protection;
- Radioactive Waste and Management Design; and
- Risk Analysis Methods.

With one additional year of study, students can graduate with a bachelor of engineering and management. This five-year program enables students to study nuclear engineering or energy systems engineering at a management level and complement their engineering knowledge with solid accounting, finance, operations, human resources and marketing skills.

## ACCREDITATION

Graduates of the Bachelor of Nuclear Engineering and Nuclear Engineering Management programs have met the educational requirements of the Canadian Engineering Accreditation Board and gained the knowledge to work as professional engineers in the many fields that comprise the energy sector. These programs have received the maximum accreditation limit of six years, valid through June 30, 2016.

## FAST FACT

In a 2010 feature article in the National Post, Nuclear Engineering graduate (class of 2010) Jeffrey Hunt says he pursued nuclear engineering after reading a report that more than a third of current engineers in the nuclear field were due to retire over the next decade. Before graduation, Hunt had already lined up a job as an analyst with Toronto-based consulting company Nuclear Safety Solutions.

# Bachelor of Applied Science (Honours) in Nuclear Power

Nuclear power plants require a large number of employees with different skills to operate and maintain them. The majority of these positions do not require a dedicated engineering degree but do require a solid foundation of science and basic engineering knowledge. These positions include control room activities, work order placements, procurement, maintenance, support to engineers and field work.

The Bachelor of Applied Science in Nuclear Power was developed in response to requests from people in the nuclear industry looking to upgrade their education and for potential new hires that typically will work in areas that do not have design responsibility. This degree provides the necessary science and basic engineering knowledge to perform these types of roles within the nuclear industry.

## BRIDGE PROGRAM

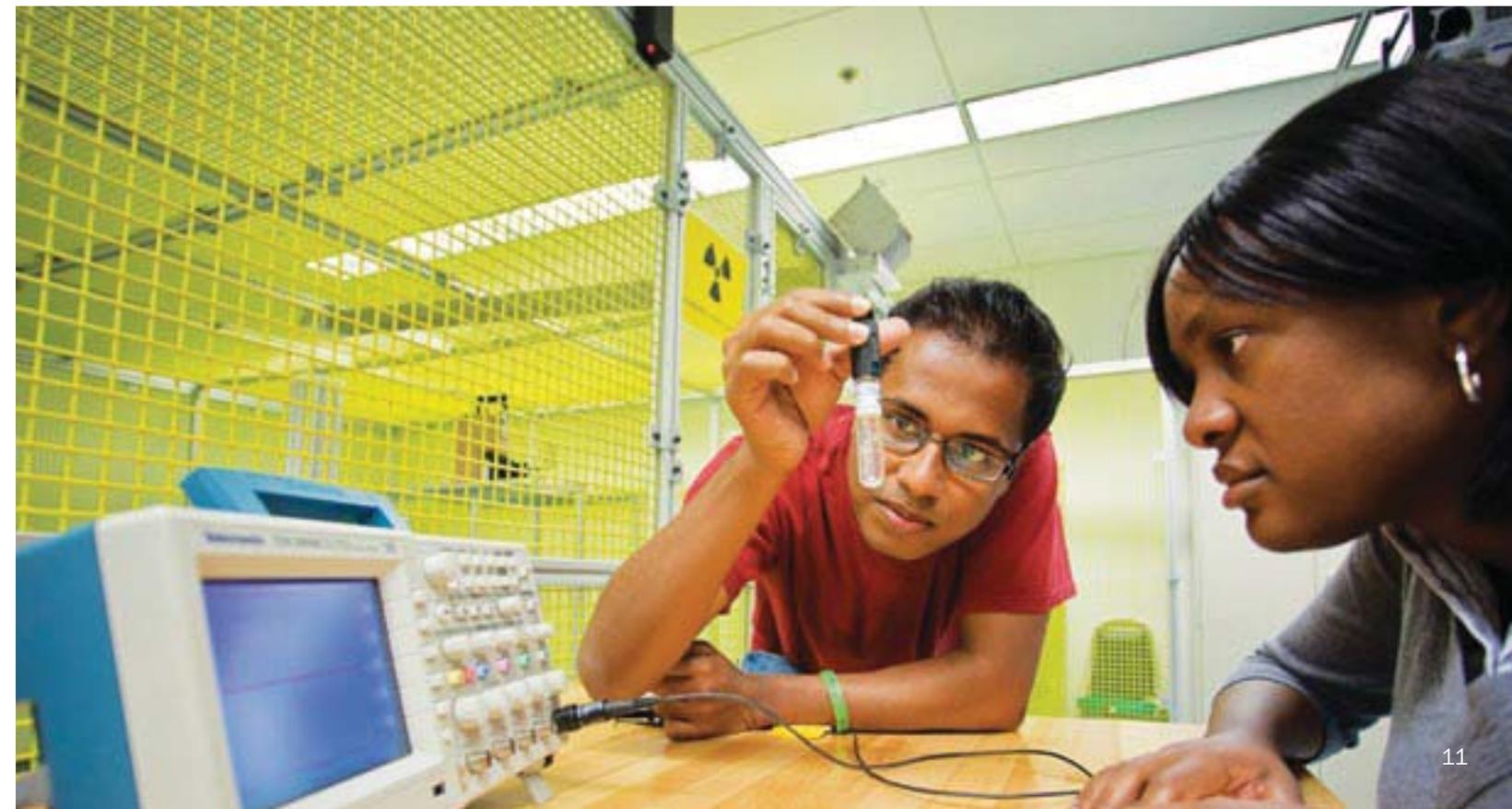
UOIT also offers a bridge program (known as bridge+2) from certain three-year Ontario college technology diplomas into the Bachelor of Applied Science in Nuclear Power.

Included in the program are courses such as:

- Introduction to Operations Management;
- Introduction to Project Management and Supply Chain Management;
- Nuclear Plant Operation and Safety;
- Nuclear Plant Electric and Auxiliary Systems;
- Nuclear Plant Steam Utilization Systems;
- Nuclear Steam Supply Systems;
- Radioactive Waste Management; and
- Reactor Instrumentation and Control.

## FAST FACT

UOIT's Energy Systems Engineering and Nuclear Engineering programs are the first stand-alone programs of their kind in Canada.



# Hands-on experience: your competitive advantage

## COMMITMENT TO RESEARCH EXCELLENCE

In addition to faculty research, FESNS offers many opportunities for students to undertake research projects. Not only do our students gain hands-on experience, but they are also encouraged to pursue graduate studies and research careers.

There are many opportunities for students to collaborate with professors on significant research projects – even at the undergraduate level – a key differentiator between UOIT and traditional higher-learning institutions.

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*“UOIT allowed me to gain valuable research experience. Over the summer and during the school year I worked as a research assistant. My research involved both the investigation of conceptual thermal-design options for supercritical water-cooled nuclear reactors and the development of heat transfer correlations. This research gave me the opportunity to submit and present papers to international nuclear conferences and publish my work in journals. I found that UOIT offered exciting opportunities and enabled me to gain knowledge for future academic and career pursuits.”*

– Sarah Mokry, Nuclear Engineering graduate class of 2008, Faculty advisor: Dr. Igor Pioro

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*“Working with my professor in FESNS during the summer has proven a great experience on many levels. By applying the knowledge gained through studies to relevant research projects, the processes bridging theory and practice have become very clear. I cannot imagine a better way to prepare for a professional career in industry than by working alongside professors and peers on research projects at UOIT.”*

– Tristan Charles, Nuclear Engineering class of 2011, Faculty advisor: Dr. Glenn Harvel

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## INTERNSHIP AND SUMMER EMPLOYMENT OPPORTUNITIES

We are committed to providing students with outstanding opportunities to work with today’s highest-quality employers in the energy systems and nuclear science industries. UOIT has developed close relationships with many industry partners provincially, nationally and internationally, and many of our students have opportunities to work at these companies as co-op or internship students for periods ranging from four to 16 months prior to graduation.

The Faculty of Energy Systems and Nuclear Science offers a wide range of optional internship and co-op programs, practicum experience and work and field placements; all of which vary, depending on the area of study. These experiences give you an opportunity to apply classroom and lab concepts to practical situations and help you to gain valuable, relevant work experience to promote networking and lifelong career success.



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*“Going through high school, trying to figure out what kind of career I wanted, Health Physics hadn’t really crossed my mind, until the university fair where I learned about UOIT and the Health Physics and Radiation Science program. Looking back, I wouldn’t change a thing. My four-year undergrad turned into a five-year program with an internship at the Canadian Nuclear Safety Commission (CNSC) which I achieved acceptance into through the staff in my faculty. My acquired knowledge and skills from in-class learning and laboratory settings allowed me to excel with the CNSC and landed me a full-time position in Ottawa.”*

– Lenora Makin, Health Physics and Radiation Science graduate, class of 2011.

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*“UOIT’s Health Physics and Radiation Science program prepared me for an incredible internship with the Canadian Nuclear Safety Commission. My professors have always said that the nuclear field is an international industry, but I never dreamt that I would be a delegate representing Canada’s nuclear industry at a convention in Austria hosted by the International Atomic Energy Agency. It was also a major bonus to be able to network with managers and vice-presidents from other companies such as Ontario Power Generation, the Nuclear Waste Management Office, France’s energy conglomerate AREVA and Atomic Energy of Canada Limited.”*

– Anupama Bulkan, Health Physics and Radiation Science student class of 2010

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*“The Nuclear Engineering program is more than just textbooks and lectures – it provides vast real-world and nuclear industry knowledge, through my internship with Bruce Power, and through professors that were involved and are still involved in the nuclear industry today.”*

– Farshad Sani, Nuclear Engineering graduate class of 2009

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# Opening the doors to challenging and rewarding careers

At UOIT, our strong partnerships with leading employers open doors to challenging and rewarding careers for students. Combine that with the analytical and problem-solving skills you gain in the classroom and you will have the experience necessary for any number of exciting occupations. You are limited only by your imagination!

Employment opportunities can be found locally, regionally, nationally and internationally as the nuclear renaissance continues. Major companies such as Ontario Power Generation, Nuclear Safety Solutions, Atomic Energy of Canada Limited and the Canadian Nuclear Safety Commission have all hired students from our programs, in addition to numerous other companies and organizations.

Our graduates are equipped with the knowledge and experience to pursue careers in any of the following fields:

## Careers in Nuclear Engineering

- Designing, building and commissioning world-class nuclear reactors;
- Environmental assessment;
- Operating, maintaining and refurbishing existing nuclear facilities;
- Safety analysis, regulatory monitoring; and
- Uranium mining, nuclear fuel design manufacturing.

## Careers in Health Physics and Radiation Science

- Application of nuclear technologies in material science and sterilization of food and medical equipment;
- Application of radiation in medicine (following suitable post-graduate training);
- Environmental radiation monitoring;
- Non-destructive testing and forensic analysis including carbon dating and art authentication;
- Radiation detector development and the maintenance of national standards for radiation measurements and dosimetry;
- Radiation protection in nuclear power plants and uranium mining; and
- Radiation protection for public health and safety.

## Careers in Energy Systems Engineering

- Designing and researching innovative environmentally friendly systems for energy conversion, pollution control devices, energy storage or energy use;
- Designing, building and monitoring Ontario's electrical grid;
- Designing, building, operating and maintaining energy facilities such as hydro dams, wind farms, solar stations or other local grid generation methods; and
- Managing the energy supply and demand of a city or province.

*"I completed a 12-month internship with Ontario Power Generation (OPG). I had never planned on taking a year off school, but when this opportunity presented itself, I couldn't say no. This has become another decision that has well-exceeded my expectations and allowed me to gain experience in nuclear engineering. The internship was invaluable because it gave context to all of the lessons and allowed me to develop an even deeper knowledge of the material. My internship also allowed me to gain knowledge of the workplace at OPG and other nuclear industry companies, which helped my career planning."*

- Daniel Hobbs, Nuclear Engineering graduate class of 2009

### FAST FACT

Approximately 50 per cent of the electricity consumed in Ontario is generated by nuclear power plants.

# Leading-edge learning environment

The Energy Research Centre (ERC) is a 9,290-square-metre facility that houses UOIT's unique-in-Canada education programs and research in geothermal, hydraulic, hydrogen, natural gas, nuclear, solar and wind energy technologies. As the home of FESNS, the ERC enables leading-edge research in clean and green energies and technologies, and promotes Canada's entrepreneurial advantage through public-private research and commercialization partnerships.

The spacious, four-storey ERC features a spectacular glass-covered atrium, a 72-seat lecture theatre, three 50-seat classrooms, two 30-seat tutorial rooms with flexible seating and multimedia capabilities, 12 labs, 11 student-study (breakout) rooms, dedicated working stations for graduate students and offices for faculty and administration.

The ERC is the result of a joint \$45.4-million investment from both the federal and provincial governments as part of the Government of Canada's Knowledge Infrastructure Program. Full ERC operations commenced during the 2011-2012 academic year.

## ENVIRONMENTAL RADIATION LAB

Gain valuable hands-on experience while working in the Environmental Radiation Lab, where you will learn to use the same equipment currently being used in the nuclear industry. You will collect environmental samples during field trips and analyze them using gammaspectroscopy systems such as sodium iodide crystal and germanium crystal to determine the significant pathways of radionuclide from facilities to humans.

The lab is also equipped with advanced equipment, including liquid scintillation counters and stands as well as remotely monitored radiation protection devices for the detection and quantification of radioactivity. In your final lab class, you will have the opportunity to demonstrate your knowledge by collecting samples and analyzing them quickly in the field while co-ordinating emergency response duties in the event of a radiological emergency.

## NUCLEAR SIMULATION LAB

The Nuclear Simulation Lab houses a state-of-the-art computer and display system for the operation and simulation of nuclear power plants. You will receive instruction on a virtual Candu 9 simulator as well as learn how to use Ontario Power Generation's (OPG) only off-site full scope virtual simulator in the world, designed for the Pickering and Darlington nuclear-electric generating units. The Faculty of Energy Systems and Nuclear Science also has the capability to develop software for advanced reactor designs within the lab.

## RADIATION PROTECTION AND SCIENTIFIC INSTRUMENTATION LABS

The Radiation Protection Laboratory features Geiger counters and gamma-ray spectrometers designed to measure radiation and determine the properties of alpha, beta and gamma radiation. You will be introduced to field survey meters and alpha-beta swipe counters to help you become familiar with the measuring techniques of ambient gamma radiation and to monitor contamination. You will also have access to a variety of radioactive sources that are used in teaching labs and research.

Student labs are conducted in the Scientific Instrumentation Lab where you learn how to analyze data acquired using various technologies such as strain gauges and thermocouples. Using a data acquisition device which interfaces with Labview (a powerful software package that allows rapid development and testing of measurement instrumentation in industrial and laboratory settings), you learn how to employ various signal conditioning methodologies in order to manipulate the inputs as needed. You will also learn the basics of filter design by creating your own high frequency bypass filter.

## CORROSION AND ELECTROCHEMISTRY LAB

The Corrosion and Electrochemistry Lab is operated by Dr. Brian Ikeda and was established to investigate the electrochemical processes that drive corrosion at elevated temperatures. A particular emphasis is placed on the chemical and electrochemical processes associated with corrosion processes, such as localized corrosion and stress-assisted corrosion cracking. Special equipment is used to examine processes in molten salts that range from low melting point noxious fluoride salts to high temperature metal chloride salts.

## HIGH PERFORMANCE COMPUTING AND VISUALIZATION LAB

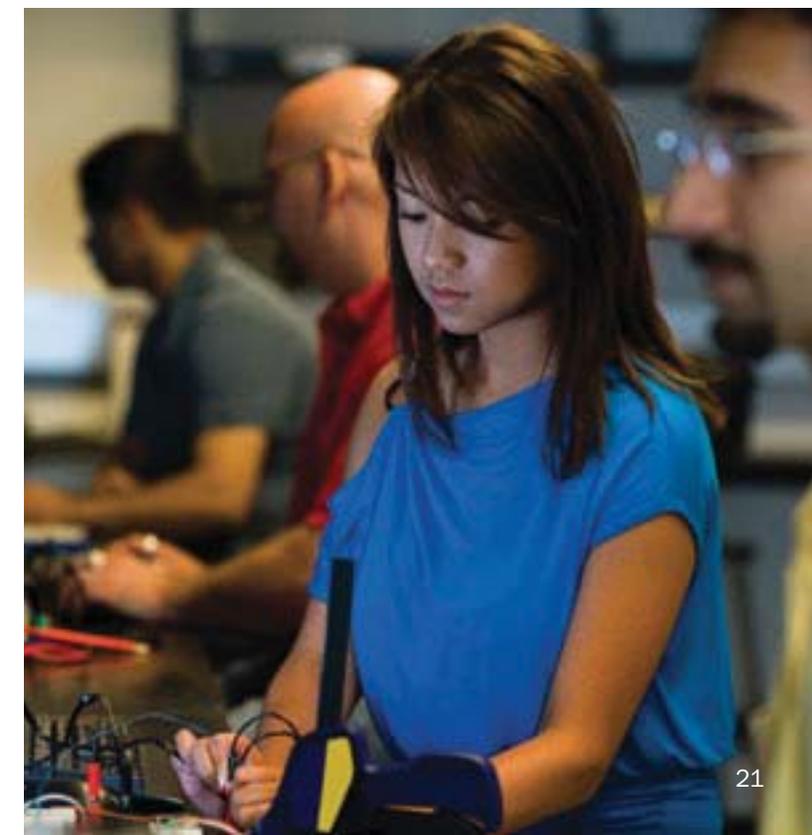
Dr. Eleodor Nichita oversees the High Performance Computing and Visualization Lab where the investigation of computational and output intensive problems that appear in reactor and radiation physics are explored. The lab supports research into parallel algorithms and methods for displaying large amounts of data in a meaningful way by using three-dimensional graphic representations.

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*"I initially chose UOIT for its wide variety of programs, especially in the Health Physics field. UOIT seemed like a place of calm, where I would be able to study properly and where I would base my career. UOIT is set apart by its professors who actively participate in their students' school life and well-being."*

– Akash Joshi, Health Physics and Radiation Science student, class of 2012

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# Challenge yourself outside the classroom

## FAST FACT

UOIT's Nuclear Engineering program features the most extensive nuclear power plant computer simulation of any engineering program in Ontario.

UOIT understands full well that your university experience is about more than just the challenges you face in the classroom. From your first day on campus, you'll find a variety of activities that meet your unique interests.

Various fun activities and informative sessions are planned to welcome you to campus and assist you with the transition to university. In addition, the Student Experience Centre works year-round to offer you comprehensive orientation programming.

You can get connected through dozens of campus clubs, including groups that relate to your program such as the UOIT branch of the Canadian Nuclear Society (CNS), Engineers Without Borders and the Solar Car team.

FESNS also sponsors numerous highly regarded industry conferences, providing the opportunity for you to attend and participate. These include the International Youth Nuclear Conference, the Canadian Nuclear Society Student Conference, the Canadian Nuclear Association Seminar and the International Conference on Nuclear Engineering.

## ZIRC RING CEREMONY

A tradition started by the first graduating class, the Zirc ring ceremony is an annual event held for all students who graduate from an undergraduate program within FESNS. Each graduate receives a ring made of zircaloy which is the same material used to make nuclear fuel cladding. The ring represents the specialized knowledge that each graduate has obtained.



# Here for students every step of the way

At UOIT, we know that success is always a team effort. Our commitment to your success includes a range of services backed by our friendly, knowledgeable and caring staff.

FESNS provides a number of services that are designed to ensure your success, including academic advising, learning support and career and professional planning. Through your academic advisor, you have access to many personalized services that will help you make choices in support of your academic and personal achievement.

Your academic advisor is your main contact within FESNS and is available to help, support and encourage you as needed.

## INFORMATION TECHNOLOGY SERVICE CENTRE

<http://itsc.uoit.ca>

You've never experienced education like this before. UOIT's national award-winning mobile learning environment allows you to connect with your professors and peers any time, anywhere – and puts you one step ahead when you graduate. As Ontario's first laptop-based university, UOIT is a leader among North American universities in implementing and using course/industry-specific software for laptop learning.

## LIVING AND LEARNING - RESIDENCE

[www.uoit.ca/accommodations](http://www.uoit.ca/accommodations)

At UOIT, we offer the best of both worlds when it comes to residence – all the comforts of home in a unique campus community experience. The Simcoe Village and South Village residences offer accommodations for 1,364 students. And if you are a first-year student, you are guaranteed a spot in residence if you meet the deadlines for accepting UOIT's offer of admission and applying to residence.



## CONVENIENT AND AFFORDABLE TRANSIT

[www.uoit.ca/transit](http://www.uoit.ca/transit)

Getting to campus has never been easier or more affordable thanks to newly expanded transit routes and the U-Pass, which provides you with unlimited access during the academic year to Durham Region Transit and GO Transit bus service within Durham Region. Durham Region Transit provides bus service in all the region's communities. More good news – as a UOIT student, you pay a reduced fee for GO Transit bus service to and from the campus from locations outside of the region, such as Scarborough and Markham.

## ADDITIONAL CAMPUS SERVICES INCLUDE:

**Academic Success Centre** (<http://asc.apa.uoit.ca>) provides individual and small group academic support in English writing skills, science and math (for engineering students) and learning strategies to improve your grades and promote your academic success;

**Campus Health Centre** ([www.uoit.ca/campushealthcentre](http://www.uoit.ca/campushealthcentre)) features a full-service pharmacy and medical clinic that offers extended hours of service, on-site doctors and nurses, on-site counselling and a variety of alternative health services;

**Centre for Students with Disabilities (CSD)** (<http://www.uoit.ca/csd>) works with students who are blind, have low vision, are deaf, hard of hearing, or have a physical, medical, psychiatric or learning disability;

**Student Experience Centre** (<http://studentexperience.uoit.ca>) offers a wide variety of services to support your personal and career development including: Career Services, Off-Campus Living and Orientation Week; and

**Support for International Students** ([www.uoit.ca/international](http://www.uoit.ca/international)) includes services such as immigration advising and student mentoring.





# Admission requirements

UOIT expects students applying for admission to all undergraduate Faculty of Energy Systems and Nuclear Science programs to present at minimum an Ontario Secondary School Diploma (OSSD) (or equivalent) with a minimum of six 4U or 4M credits, including:

- English (ENG4U);
- Advanced Functions (MHF4U);
- Calculus and Vectors (MCV4U);
- Chemistry (SCH4U); and
- Physics (SPH4U).

In addition, a combined minimum average of 70 per cent in math and science courses is required, with no grade below 60 per cent.

Student selection is determined through consideration of a wide range of criteria including school marks, distribution of subjects taken and performance in subjects relevant to the academic program. The specific average or standing required for admission varies from year to year. Possession of minimum requirements does not guarantee acceptance. Preference will be given to applicants with the best qualifications.

For complete information on the current admission requirements to UOIT undergraduate programs, please visit [www.uoit.ca/programs](http://www.uoit.ca/programs).

# Financing your education

[www.uoit.ca/scholarships](http://www.uoit.ca/scholarships)

Because your education is one of the most important investments you'll ever make, our Student Awards and Financial Aid (SAFA) office works hard to ensure you have everything you need to meet your financial obligations. We are committed to helping you with the financial aspect of your post-secondary experience and encourage you to take advantage of the Ontario Student Assistance Program (OSAP), budget counselling and on-campus and summer employment opportunities to help offset the cost of your tuition, books and other fees.

We offer a variety of scholarship awards and bursaries to help you meet the cost of a university education. In addition, thanks to the generosity of donors, there are a variety of other student awards available if you are in financial need and in good academic standing.

## We are here to help.

Faculty of Energy Systems and Nuclear Science  
2000 Simcoe Street North  
Oshawa, Ontario, CANADA  
L1H 7K4

T: 905.721.3190

F: 905.721.3178

[www.nuclear.uoit.ca](http://www.nuclear.uoit.ca)

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