DISCOVER ENGINEERING

VIEWBOOK 2015-2016

UNIVERSITY OF TORONTO | Engineering

WELCOME TO U OF T ENGINEERING, CANADA'S TOP ENGINEERING SCHOOL

U OF T ENGINEERING: AN EXCEPTIONAL COMMUNITY

No university in Canada—and perhaps the world—is in a better position to offer an education that will help the brightest students meet the grand challenges that humanity now faces.

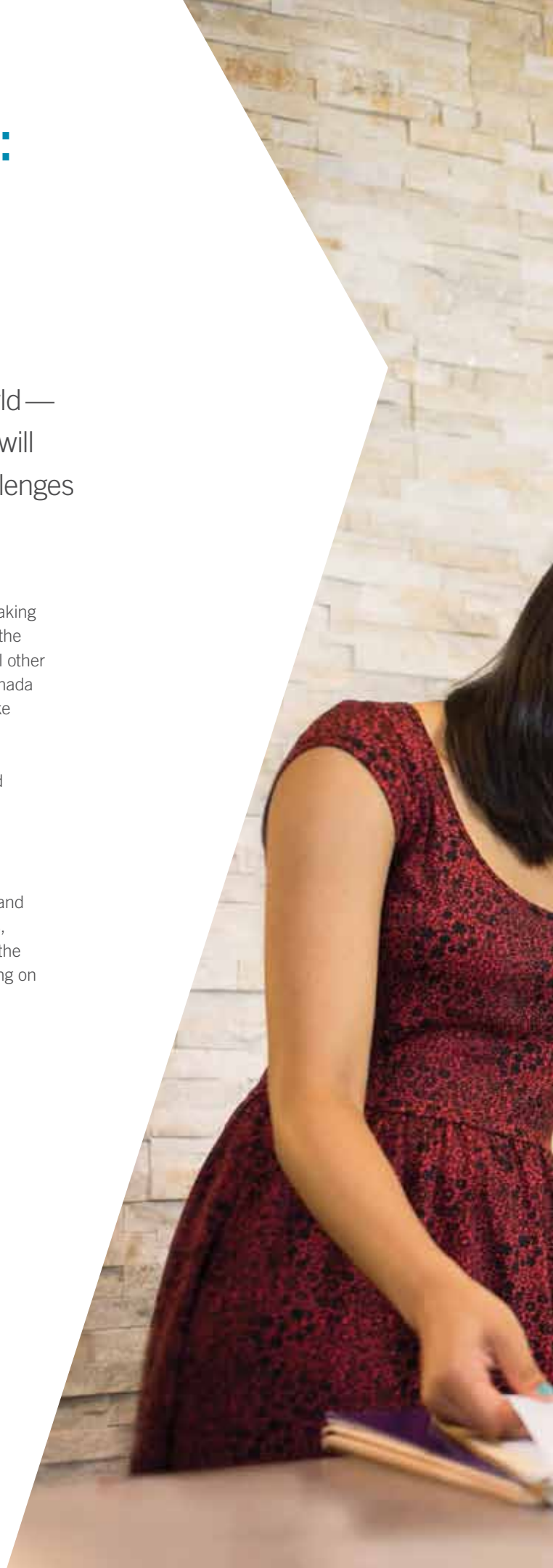
Here you'll find a global community producing innovations and engineering creativity. We are at the forefront of engineering research—in the groundbreaking areas we explore, the ways we collaborate and the contributions we make to the profession. The *Times Higher Education World Ranking of Universities* and all other international rankings consistently rate U of T Engineering number one in Canada and one of the best in the world. We're preparing engineers of tomorrow—like you—to unlock the boundless potential of the future.

You will study among talented students who bring their own perspectives and passions to the mix. Last year's student body was the most diverse in our history, with students from eight Canadian provinces, one territory and over 100 countries.

The U of T Engineering community is known for being especially supportive and tight-knit. You'll attend many of your classes with the same group of students, making it easy for you to feel comfortable very quickly. We're proud of being the oldest and finest engineering school in Canada and we look forward to passing on our revered traditions to new students.

U OF T ENGINEERING IS THE PREMIER ENGINEERING SCHOOL IN CANADA

according to all four rankings of universities around the world. Learn more at www.uoft.me/engexplore.



"U of T Engineering has been such a welcoming environment for me. The culture is very hospitable for people from different places."

RICARDO RITTER DeSOUZA BARNASKY,
SCIENCE WITHOUT BORDERS (SWB)
MATERIALS ENGINEERING

"U of T Engineering is a globally recognized community that provides unparalleled opportunities for practical experience and networking."

ENAKSHI SHAH, GENERAL FIRST YEAR

"I love the fact that I've had the chance to expand my horizons, both personally and professionally."

MADONNA KHALIL, CHEMICAL ENGINEERING

TORONTO: ONE OF THE WORLD'S GREAT CITIES

U of T Engineering lies in the heart of Toronto—a city unparalleled in diversity. From unique cultural festivals and concerts to unforgettable attractions and restaurants, Toronto offers exciting experiences on a daily basis.

DIVERSE NEIGHBOURHOODS

More than 140 cultures shape this dynamic metropolis. Toronto may be the fourth largest city in North America, but your classmates will tell you that it's safe, warm and welcoming. Hundreds of small, friendly neighbourhoods are really what Toronto's all about. Each pocket has a special flavour and character. Bordering the campus is Chinatown, the leafy Annex, lively Kensington Market and upscale Yorkville (epicentre of movie star sightings). A short subway, bus, streetcar or bicycle ride away there's Little Italy, the trendy music and fashion scene on Queen Street West, Greektown and Little India. The city comes alive in the Entertainment District, and a wintertime skate at City Hall has become a tradition you won't want to miss.

ARTS & ENTERTAINMENT

We have something for every taste in all four seasons: symphony to hip hop, theatre to improv, Art Gallery of Ontario to Royal Ontario Museum, ballet to the annual Zombie Walk. With hundreds of indie galleries, clubs, theatres and concerts, there's always something to do. Festivals, cultural events and parades fill the calendar. Each June, Toronto hosts one of the world's largest Pride festivals. September brings the Toronto International Film Festival. Seven professional sports teams are based here, including the Maple Leafs (hockey) and Raptors (basketball). Ski and snowboard just an hour north of the city. And if you're daring, harness up for EdgeWalk, a stroll around the outside of the CN Tower's observation deck — 1,168 feet above ground.

A GREAT PLACE TO LIVE

U of T is located in the heart of an energetic city, renowned for its quality of life. We can confidently say Toronto is a fantastic place to live, study and work. For example, did you know that the Economist Intelligence Unit's *2013 Liveability Ranking Report* ranked Toronto as the fourth most livable city in the world? Toronto was also ranked the second best city of opportunity in the world (PricewaterhouseCoopers).

Learn more about Toronto from a student perspective:
www.uoft.me/cityoftoronto

Electrical & Computer Engineering students Kathryn McIntosh and Adam Chan take a break from their studies to visit the Art Gallery of Ontario.

ENGINEERING INNOVATION: ATLAS HUMAN-POWERED HELICOPTER

AeroVelo's Atlas human-powered helicopter won the American Helicopter Society's Igor I. Sikorsky Challenge and its $250,000 prize on June 13, 2013.

FEATURED PROJECT
Learn more at www.uoft.me/20L

"With good engineering and creative thinking we have the ability to make the impossible real. It's an exciting world out there, and engineering gives you the tools to push it to the limit!"

DR. TODD REICHERT
AEROVELO CO-FOUNDER AND U OF T ENGINEERING GRADUATE


1


2

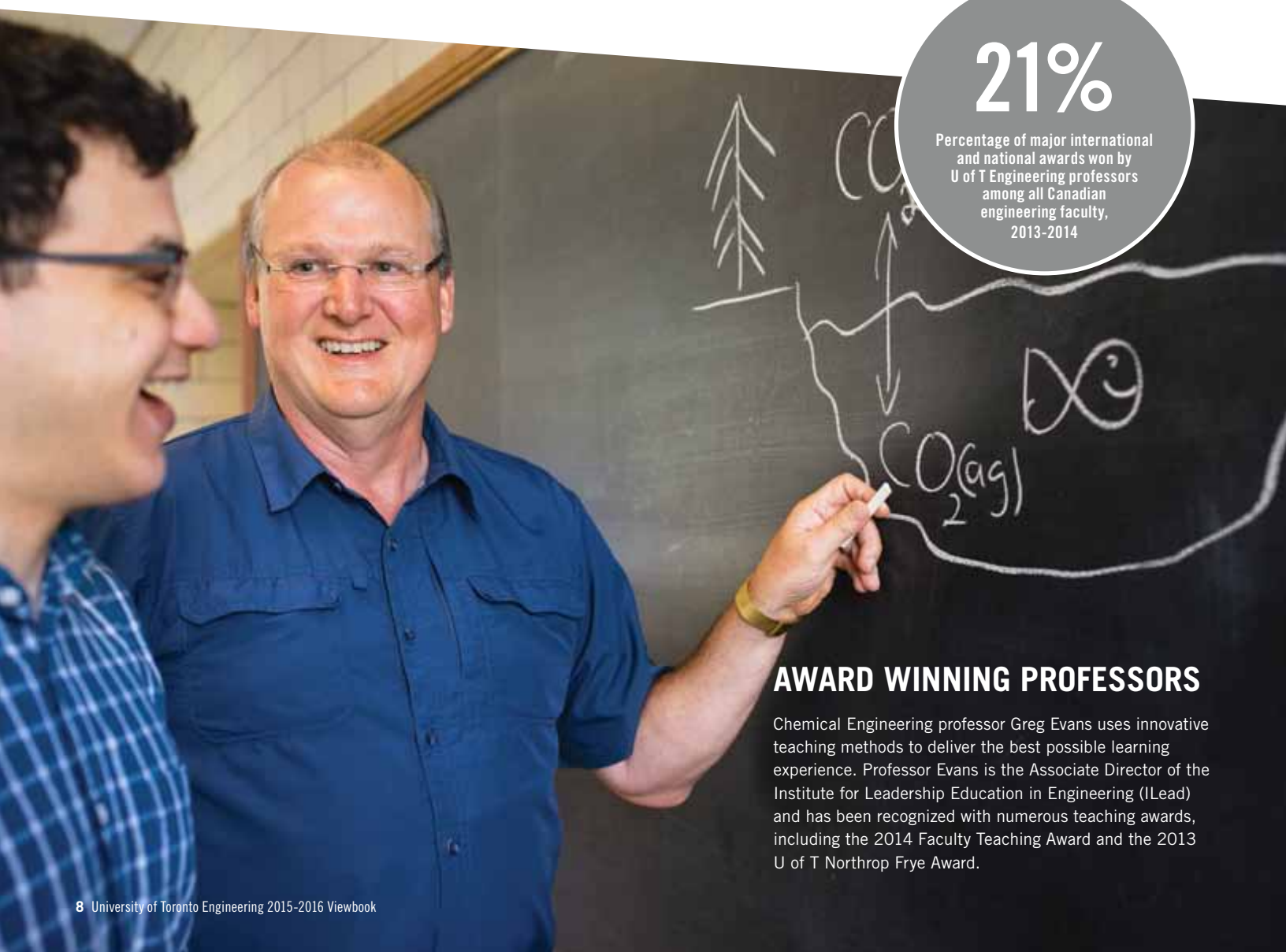

3

1 & 2. Each year AeroVelo recruits a team of U of T Engineering undergraduate students to be involved in the next awe-inspiring engineering challenge. During the intense four-month summer program, students participate in the detailed design, construction and testing of aircraft and land-vehicles.
3. Dr. Todd Reichert (left) and Cameron Robertson, co-founders of AeroVelo.

During the record-breaking 64-second flight, Atlas reached a height of 3.3 metres, making AeroVelo the first team to meet the requirements of this 33-year-old aviation challenge. The Sikorsky Prize is the third largest monetary award in aviation history.

CUSTOMIZE YOUR ACADEMIC EXPERIENCE

U of T Engineering offers you the most interdisciplinary engineering education in Canada. You can tailor your degree through academic options, minors and certificates, adding breadth and depth to your studies. Academic flexibility combined with a wide range of leadership, entrepreneurship, career development and extracurricular opportunities means that you graduate as a well-rounded engineer, equipped with fundamental engineering knowledge and perspective to tackle any challenge. All of our programs are fully accredited and our degrees are recognized worldwide. Graduates are eligible to become registered Professional Engineers (PEng).



AWARD WINNING PROFESSORS

Chemical Engineering professor Greg Evans uses innovative teaching methods to deliver the best possible learning experience. Professor Evans is the Associate Director of the Institute for Leadership Education in Engineering (ILead) and has been recognized with numerous teaching awards, including the 2014 Faculty Teaching Award and the 2013 U of T Northrop Frye Award.

OUR PROGRAMS

Choose one of our Core Program options or apply directly to Engineering Science.

CORE PROGRAMS

Direct entry programs:

- Chemical
- Civil
- Computer
- Electrical
- Industrial
- Materials
- Mechanical
- Mineral

OR

General First Year

Explore engineering before choosing to join a Core Program in second year. See pages 10 to 17 for details.

ENGINEERING SCIENCE

Engineering Science is an enriched program that prepares students for a wide range of fields. Your first two years will build a solid engineering foundation while your last two years focus on one of eight specialized majors. See page 18 for more information.

FIRST YEAR

Establish your foundation in engineering through courses in math, science, programming and a team-based design course, Engineering Strategies & Practice.

Start EngSci with classical mechanics, math and circuits. You'll also work with a team to solve a real issue in Toronto through your engineering design course, Praxis.

SECOND YEAR

Expand your knowledge with more courses in your discipline. Gain a greater depth of understanding through enhanced lab experiences and design opportunities.

Apply your knowledge through more foundational courses and prepare to select a major for the last two years of your studies. Consider opportunities to study, work abroad or participate in entrepreneurship activities or summer research in the Faculty.

Choose to complement your studies with one of our **minors** or **certificates** (see page 20), **study abroad** or **summer research** opportunities (see page 24).

THIRD YEAR

Focus your studies further towards your developing interests and think about how the Professional Experience Year (page 25) might fit into your journey.

Delve into your major (page 19) and consider the Professional Experience Year internship program (page 25).

PROFESSIONAL EXPERIENCE YEAR (PEY)
OPTIONAL INTERNSHIP PROGRAM

If you choose to participate in the Professional Experience Year internship, you'll take a break from your studies for 12 to 16 months to work in a full-time engineering position. This is your opportunity to put your education to work in the real world while adding invaluable experience to your resume and earning a great salary. See page 25 for more information.

FOURTH YEAR

Apply the skills and knowledge you've developed with the opportunity to complete a team-based design or research project.

Apply your knowledge, skills and talents through a team design project and an individual research thesis.

UPON GRADUATION

The Core Programs lead to a Bachelor of Applied Science (BASc), and Engineering Science leads to a BASc in Engineering Science.

BASc degree

BASc in Engineering Science degree

SKOLL PROGRAM (BASC/MBA)

If a Master of Business Administration (MBA) is in your future, consider the Jeffrey Skoll program. This joint program allows you to combine your engineering studies with an MBA from U of T's prestigious Rotman School of Management and graduate with BASc and MBA degrees. Visit **www.uoft.me/skollprogram** for more information.

Megha Jain (left), a General First Year student, works with Civil Engineering student Gordon Dri on a rooftop garden project for Engineering Strategies & Practices, a design course that addresses real-world challenges.

GENERAL FIRST YEAR

General First Year, also known as TrackOne, is designed for students interested in exploring all fields of engineering before choosing to join a Core Program in second year.

Students who choose this program spend their first year taking a wide range of engineering courses. This approach helps you discover your interests within U of T Engineering while you develop a strong foundation in key engineering principles. **After you've successfully completed your first year*, you are guaranteed a spot in the Core Program of your choice** (Chemical, Civil, Computer, Electrical, Industrial, Materials, Mechanical or Mineral) and you will continue toward your four-year Bachelor of Applied Science degree. Your courses will be similar to those taken by first-year students in the Core Programs, so the transition to second year will be smooth. This program will challenge you to think about engineering from many different points of view.

The General First Year is ideal for academically strong students who are interested in conquering this century's major challenges through engineering, but are unsure of the careers available to graduates from each field, or want more knowledge to choose their engineering program. Through your *Introduction to Engineering* seminar course, you'll learn how each engineering field contributes to society. Your professors will show you the connections between all the engineering disciplines so you'll feel engaged and inspired to learn more. Support from your academic advisor will help you with your choice at the end of first year.

FIRST-YEAR COURSES

- Calculus I and II
- Computer Fundamentals
- Dynamics
- Electrical Fundamentals
- Engineering Strategies & Practice I and II
- Ethics in Engineering
- Introduction to Materials & Chemistry
- Linear Algebra
- Mechanics
- Seminar: Introduction to Engineering

* General First Year students who achieve a minimum average of 60 per cent in both semesters are guaranteed entry to the Core Program of their choice in second year.

Amy Sang, a Chemical Engineering student, works in a bioprocessing lab on a project that focuses on the production of biofuels from algae.

CHEMICAL

Chemical engineers combine chemistry, biology, math and engineering to solve urgent problems and create innovative processes and products.

As a Chemical Engineering student, you will learn to address issues with a large impact on society: the need to decrease our environmental footprint, create sustainable processes and improve human health. Our professors are at the forefront of research to develop renewable fuels and materials, use biotechnology to clean up pollution, manufacture products sustainably, create artificial organs, and fortify foods to address malnutrition.

U of T Chemical Engineering offers one of the top programs in Canada. In the first two years, you will gain a solid foundation in chemistry, physics, math and engineering principles. In your upper years, you can explore any of the Faculty's six minors (see page 20) and choose courses in areas like **bioprocess engineering**, **biomedical engineering**, **sustainable energy, water & waste water treatment**, and **environmental engineering**. You are also eligible to do a research project as part of the program.

Your program will teach you to design, build and improve products, systems and processes. You'll put theory into practice in our innovative courses and laboratories, including the unique Unit Operations Lab, filled with large-scale industrial equipment including a two-storey distillation column. In your fourth year, you'll be part of a student team that will design an industrial processing plant from concept to implementation in just 10 weeks. You can also take advantage of support for summer research and opportunities to study abroad.

FIRST-YEAR COURSES

- Calculus I and II
- Concepts in Chemical Engineering
- Engineering Strategies & Practice I and II
- Ethics in Engineering
- Fundamentals of Computer Programming
- Introduction to Materials Science
- Linear Algebra
- Mechanics
- Physical Chemistry

Momo Sun and her classmate work with John MacDonald, Engineering Technologist in the Civil Engineering Structural Testing Facility, a lab that ensures important building materials can withstand environmental stresses, like natural disasters.

CIVIL

Civil engineering focuses on the design, construction and maintenance of structures and infrastructure, from the deepest tunnels to the tallest buildings.

Students in the Civil Engineering program choose courses in areas like **Structural Engineering**; **Transportation Engineering & Planning**; **Building Engineering**; **Geomechanics**; and **Environmental Engineering**. In each of these areas, Toronto is a living lab for our students.

Your work here will prepare you to create solutions that will directly impact quality of life everywhere: rebuilding deteriorating urban infrastructure; creating structures to withstand natural disasters; developing advanced technologies for complex transportation networks; supplying clean water and disposing of waste water; and building alternative energy systems.

You will learn in some of the world's most advanced facilities. Your program begins with math, computing, chemistry, physics, applied structural mechanics, fluid mechanics, hydraulics, materials, surveying, geology, computer graphics and engineering ecology. Upper-year courses will provide hands-on experience, like our one-of-a-kind land surveying camp north of Toronto. You'll complete your program with a comprehensive design project that solves a real-world engineering problem. U of T's Department of Civil Engineering is consistently ranked number one in Canada and among the top 10 in the world.

FIRST-YEAR COURSES

- Calculus I and II
- Earth Systems Science
- Engineering Strategies & Practice I and II
- Ethics in Engineering
- Fundamentals of Computer Programming
- Introduction to Materials Science
- Linear Algebra
- Mechanics
- Physical Chemistry

Electrical Engineering student Junqian Zhang makes last-minute adjustments to his hand-motion controlled quadcopter drone before putting it to the test in a grand aerial robotics battle.

ELECTRICAL & COMPUTER

Electrical and computer engineers deal with two key issues of our time: the creation and distribution of energy; and the communication and control of digital information.

Your professors are conducting leading-edge research on the most rapidly developing technology the world has ever seen: harnessing natural energy from the sun, wind, earth and sea; building groundbreaking biomedical devices that will improve quality of life; making it safer and faster to store your data in the cloud; and developing apps that could become the next smartphone must-haves. Multi-touch sensing is just one of the pioneering technologies developed here. When you choose Electrical or Computer Engineering, you'll have the opportunity to shape the future of technology.

In the first two years of both programs, you'll study engineering design and communication, math, digital systems, electronics, communication systems, computer architecture and software.

In upper years, you'll focus on one of six general areas: **Photonics & Semiconductor Physics**; **Software**; **Electromagnetics & Energy Systems**; **Analog & Digital Electronics; Communications**, **Signal Processing & Control**; and **Computer Hardware & Networks**.

At U of T, the Electrical and Computer Engineering programs are housed within the same department. We are the only university in Canada with a critical mass of researchers who are world-leading experts in both electrical and computer engineering. Our program is the highest-ranked and one of the largest in Canada, with 78 professors.

FIRST-YEAR COURSES

- Calculus I and II
- Computer Fundamentals
- Dynamics
- Engineering Strategies & Practice I and II
- Ethics in Engineering
- Electrical Fundamentals
- Introduction to Materials & Chemistry
- Linear Algebra
- Mechanics
- Seminar: Intro to Electrical & Computer Engineering

Industrial Engineering student Areeba Zakir tests the driving simulator in the Human Factors & Applied Statistics Lab where she does summer research.

INDUSTRIAL

Industrial engineers improve the way people interact with technologies and systems. They help organizations run safely, efficiently and profitably.

Our Industrial Engineering program is the finest of its kind in Canada. Professors bring their research into the classroom, which allows you to take part in groundbreaking work that has practical implications.

You will begin by learning industrial engineering basics: statistics, operations research and human-centred systems design. In your upper years, you'll take courses in engineering psychology and human performance, scheduling and healthcare systems. After second year, you can choose to take courses in the following areas: **Human Factors**; **Operations Research**; and **Information Engineering**. In your fourth year, you'll tackle a year-long, hands-on project aimed at solving a client's real-world problem. Through your courses, you'll develop strong problem-solving skills and become proficient at leading teams.

After you graduate, your ability to see 'the big picture' can be used to streamline an operating room, distribute products worldwide, improve customer relations online, or analyze trades on the stock market. Industrial engineering is closely tied to business, and many of our grads go on to MBA programs, become management consultants, or pursue careers in hospital administration.

FIRST-YEAR COURSES

- Calculus I and II
- Dynamics
- Electrical Fundamentals
- Engineering Strategies & Practice I and II
- Ethics in Engineering
- Fundamentals of Computer Programming
- Introduction to Materials Science
- Linear Algebra
- Mechanics
- Seminar: Intro to Mechanical & Industrial Engineering

Materials Engineering students prepare educational kits for nanOntario – a youth outreach program that showcases bio-inspired nanotechnology from Ontario's outdoors.

MATERIALS

Materials engineers focus on improving what things are made of and how they are made. New materials enable better performance and sustainable technologies.

You will learn from professors who create advanced materials for high-efficiency energy storage and conversion technologies, lower the cost of solar cells using silicon extracted from rice husk, and develop lightweight and high-performance materials for aerospace and automotive applications.

This is where advanced engineering and cutting-edge science meet. You'll study how to design and manipulate the structure and properties of materials at a molecular and atomic level. With a foundation in chemistry, physics and math, you'll then add specialized engineering knowledge in nanotechnology, biomaterials, adaptive polymers, advanced semiconductors, photovoltaics, forensics, and many more exciting fields. Your upper years will allow you to focus on: **Nanomaterials & Nanotechnology**; **Biomaterials & Bioengineering**; **Materials in Manufacturing**; and **Materials Processing & Sustainable Development**.

Ours is the largest and finest academic unit of its discipline in Canada. Upon graduation, you will join a close-knit network of almost 2,000 alumni around the world.

FIRST-YEAR COURSES

- Calculus I and II
- Engineering Strategies & Practice I and II
- Ethics in Engineering
- Fundamentals of Computer Programming
- Introduction to Materials Science
- Linear Algebra
- Mechanics
- Physical Chemistry

Mechanical Engineering students Amanda Santos and Galen Leir-Taha perform drag testing using a wind tunnel as part of an upper-year fluids course.

MECHANICAL

Mechanical engineers focus on how things work. Most objects—from cars to medical devices—are designed using mechanical engineering principles.

Our program is world-renowned for an applied, practical curriculum. Theory is put into practice with hands-on learning in labs and in the field. You'll take courses in physics, risk assessment, thermodynamics, biomechanics and sustainable energy. You will also learn about the physical principles of an object's design: its appearance; how the individual components work; and how to manufacture it and make it safe, economical, efficient, easy to use and environmentally responsible. After second year, you'll specialize in one of the following areas: **Mechatronics**; **Manufacturing**; **Solid Mechanics & Design**; **Energy & Environment**; or **Bioengineering**.

In fourth year, you'll be part of a student team working with an industry client to solve a problem facing their company.

Mechanical engineers understand the world as parts in motion, and they're always in demand in the marketplace. Our graduates pursue careers in a vast number of areas like designing communication systems, computers, assistive medical devices, low-carbon technologies, automotive design, power generation, nanotechnology, and composite materials.

FIRST-YEAR COURSES

- Calculus I and II
- Dynamics
- Electrical Fundamentals
- Engineering Strategies & Practice I and II
- Ethics in Engineering
- Fundamentals of Computer Programming
- Introduction to Materials Science
- Linear Algebra
- Mechanics
- Seminar: Intro to Mechanical & Industrial Engineering

Mineral Engineering students explore Kidd Creek Cooper and Zinc Mine in Timmins, Ontario.

MINERAL

Everything that humans use is either caught, grown or mined. Mineral engineering is the applied science of our interaction with the planet.

What sets the Lassonde Mineral Engineering program apart is our broad approach to the discipline: here, you learn mineral exploration, mine design and management, mineral processing and mining finance. Your courses will cover topics in chemical, civil, materials, mechanical and computer engineering, as well as math, physics and geology. You'll be taught by researchers and engineering professionals working in the Lassonde Institute of Mining, a new $20-million international centre of excellence at U of T. Your degree will provide you with the expertise to lead the way in making mining more sustainable, safe and productive. After first year, the class sizes are small, allowing for a strong sense of community. In fourth year, you'll be part of a team of students and industry engineers tasked with finding a solution to a real-world engineering problem.

Toronto is the mining finance capital of the world. It's also home to the largest group of mining company headquarters—1,600 within five kilometres of campus. Our students are in demand and are usually in a position to choose from several attractive job offers upon graduation. Through the program, you'll be able to focus on areas like: **Mining Geomechanics**; **Geological Engineering**; **Geotechnical**; and **Applied Geology**.

You'll find alumni of this program all over the globe, deep underground and in the skyscraper boardrooms of the world's most powerful companies. They locate diamond deposits, find oil reservoirs, build massive tunnels, crunch the numbers for multi-billion-dollar hydroelectric projects and design underground cities.

FIRST-YEAR COURSES

- Calculus I and II
- Earth Systems Science
- Engineering Strategies & Practice I and II
- Ethics in Engineering
- Fundamentals of Computer Programming
- Introduction to Materials Science
- Linear Algebra
- Mechanics
- Physical Chemistry

ENGINEERING SCIENCE

One of the most distinguished engineering programs in the world, Engineering Science attracts top students who are looking for an academic challenge. This enriched program is widely regarded as an innovator in engineering education.

During your first two years, you'll be immersed in a fast-paced, high-level study of fundamental engineering, math, science, computing and the humanities, along with a breadth of engineering topics. This multidisciplinary foundation of skills and knowledge is followed by two years of accelerated, discipline-specific information. In the third and fourth years, you'll choose one of seven majors.

As an Engineering Science student, you'll join a close-knit community of academically talented, hard-working, creative and highly motivated individuals. Together, you will be part of one of the most intellectually stimulating learning environments available worldwide.

Upon graduation, about half of our students pursue graduate studies at internationally renowned universities, including schools like Caltech, Stanford, Harvard and MIT. Approximately five per cent pursue professional degrees in areas such as law and medicine. Many enter the workforce after graduation in a wide range of fields and are eligible to become licensed professional engineers. Our graduates are in high demand with employers, who find Engineering Science students confident in pursuing any challenge.

Through the Praxis II Showcase, Engineering Science students apply their engineering, design and communication skills to local challenges.

12TH

U of T Engineering ranked 12th in the *Shanghai Jiao Tong Academic Ranking of World Universities,* 2013

ENGINEERING SCIENCE MAJORS

AEROSPACE ENGINEERING

Professors from the internationally recognized University of Toronto Institute for Aerospace Studies (UTIAS) will teach you all aspects of aircraft and spacecraft engineering—from flight dynamics and aerospace propulsion to advanced materials and design.

BIOMEDICAL SYSTEMS ENGINEERING

This interdisciplinary major builds a strong foundation in both engineering and the life sciences. Graduates apply their knowledge to the understanding, diagnosis and treatment of diseases and health-related conditions.

ELECTRICAL & COMPUTER ENGINEERING

In our highly connected world, electrical and computer engineering are increasingly linked; this major will give you the background and flexibility to integrate knowledge of both fields in order to develop emerging technologies and invent new ones.

ENERGY SYSTEMS ENGINEERING

This major addresses the global need for more professionals in this field. Our economy depends on affordable energy. You'll learn to tackle problems we're facing in energy generation, storage and management, and will gain an understanding of energy issues from a public-policy perspective.

ENGINEERING MATHEMATICS, STATISTICS & FINANCE

This first-of-its-kind undergraduate program teaches the financial theory that governs the dynamics of financial instruments and markets. You'll gain a strong understanding of how math and statistics apply to practice in quantitative finance through the use of engineering tools such as optimization.

ENGINEERING PHYSICS

This program attracts students who recognize the creative potential of combining physics with engineering. You can customize your studies across a wide spectrum of theoretical and experimental physics courses.

INFRASTRUCTURE ENGINEERING

Physical infrastructure is a defining feature of civilization. In this major you will learn to create safe, sustainable, economical and resilient structures and transportation systems. Your infrastructure designs will profoundly impact the economy, community and quality of life.

ENGINEERING MINORS OR CERTIFICATES

Choosing an engineering minor or certificate is an efficient and powerful way to graduate with an extra set of credentials, or just explore an area of interest, while earning your BASc. You can also take a minor through the Faculty of Arts & Science, where you'll find thousands of course options—like Economics or Cinema Studies. Doors to more interesting and rewarding jobs tend to open when you're doing something you love.

BIOENGINEERING MINOR

The Bioengineering minor provides students with the opportunity to explore a broad range of areas at the interface between biology and engineering. These include fields such as regenerative medicine, bioprocess engineering for the pharmaceutical industry, environmental microbiology, biomaterials, and bio-nanotechnology. This minor will provide students with a basic background from which to explore the breadth of life science applications related to engineering and technology development.

NEW BIOMEDICAL ENGINEERING MINOR

Specifically designed for undergrads interested in applying their technical knowledge to biomedicine and health care, this highly focused minor examines engineering's intersection with medical research and biomedical technology. This minor prepares students for the applied biomedical engineering industry with training in physiological systems, bioinstrumentation, biomechanics, and a core focus on laboratory experience.

ENGINEERING BUSINESS MINOR

This minor represents a powerful collaboration between U of T Engineering and the University's prestigious Rotman School of Management. The first of its kind in Canada, it provides knowledge of finance, economics, business management and marketing from an engineering perspective. This minor will give you a range of business-oriented opportunities when you graduate and can be a springboard to starting your own company.

ENVIRONMENTAL ENGINEERING MINOR

Through this program, you'll delve into topics such as ecology and ecological impact, waste management, water and wastewater treatment, environmental microbiology, water resources engineering, hydrology, preventive engineering, life-cycle analysis, design for the environment, and the social and environmental impact of technology.

ROBOTICS & MECHATRONICS MINOR

With this minor, you'll explore technologies that turn robotic and mechatronic systems into viable consumer products. Coursework covers micro-electromechanical systems and nanotechnology, advanced techniques for signal processing and systems control, and new system-level principles underlying embedded systems. This minor builds on the strengths of our Institute for Robotics & Mechatronics.

SUSTAINABLE ENERGY MINOR

The need for greener, more sustainable energy resources is critical—as is the need for more engineering expertise in sustainability. This extremely popular minor focuses on the sustainable use of energy, energy demand management and public policy related to sustainability.

ENGINEERING CERTIFICATES

If you want to explore more than one topic outside your main area of study, consider pursuing our undergraduate certificates:

- Engineering Business
- Engineering Leadership
- Entrepreneurship
- Global Engineering
- Mineral Resources
- Nuclear Engineering
- Renewable Resources Engineering

To obtain a minor or certificate, you need to complete a specific number of credits — three for a minor; six for a certificate — from a set of designated courses. For example, if you're interested in the Engineering Business minor, you would take courses in engineering economics, accounting and finance, competitive strategy and people management, plus two additional courses. When you graduate, your minor will appear on your transcripts. **www.minors.engineering.utoronto.ca**

Visit **www.uoft.me/academicchoice** to hear students talking about the benefits of minors.

Students in the Bioengineering minor obtain hands-on experience in renowned facilities like the Zandstra Lab where they help prepare bioreactors for large-scale manufacturing of human stem cells.

LIFE BEYOND THE CLASSROOM

Your education is more than lectures and labs. Long before you graduate, you'll be creating your own distinct brand of excellence. On top of an impressive track record of achievements, you'll have an international network of friends, contacts and mentors.

STUDENT CLUBS

With more than 400 U of T clubs and student organizations, and nearly 90 Engineering clubs, it's hard not to get involved. Join the Formula SAE race-car team, the Concrete Canoe design team or Engineers Without Borders. If you're feeling adventurous, how about the human-powered vehicle design team, climbing club or one of our many sports and special-interest teams? Take part in the proud traditions of a school that's almost 140 years old. Develop or discover your talents while having fun and forming friendships that will last a lifetime. Whatever your interests and hobbies, there's a student group that shares your views and will make you feel welcome. **www.skule.ca**

LEADERSHIP

Learn to lead effectively. Successful engineers understand themselves, inspire their teammates and transform their passions into life-changing opportunities. Activate your potential through the Engineering Leadership certificate. The first centre of its kind for engineering in Canada, our award-winning Institute for Leadership Education in Engineering offers courses, certificates and special events to help you excel as a professional engineer. You'll gain unique opportunities to challenge yourself and to dream big in a living laboratory. **www.ilead.engineering.utoronto.ca**

ENTREPRENEURSHIP

Turn your ambition into business know-how. Our professors, many of whom have launched their own successful companies, make ideal mentors, ready to provide you with hands-on expertise and support. Sharpen your business skills through the Entrepreneurship certificate or with a minor in Engineering Business (see page 20). The new Entrepreneurship Hatchery is a hothouse for entrepreneurial undergraduate engineers—like you. At the Idea Market, a panel of seasoned entrepreneurs can help you move your product from prototype to market. **hatchery.engineering.utoronto.ca**

Visit our website to watch videos and learn more about these great opportunities:
www.uoft.me/beyondacademics

120
Number of spin-off companies created by U of T Engineering research (1970-2013)

U of T Varsity swimming

Blue Sky Solar Racing is a U of T Engineering student club that designs, builds and races world-class solar powered vehicles.

Skule Nite

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COMMUNICATIONS

To succeed in your studies and as a professional engineer, you'll need strong writing and speaking skills. Our Engineering Communication Program will teach you how to be an effective communicator. When you express your ideas via reports, essays, proposals, case studies, presentations, memos—and even emails—you'll be confident that your words are compelling and easy to understand. You can book a one-on-one appointment with a tutor, attend workshops and tutorials, use online teaching tools and access how-to outlines.

SUMMER RESEARCH

Engineering students can apply to a variety of summer research opportunities. As a valuable member of a research team, you'll gain hands-on experience while making great connections with your professors and other researchers around the world. Even better, your name could appear on a groundbreaking research paper. Imagine the excitement of working alongside engineers who are shaping the future of the profession—and perhaps the world.

STUDY ABROAD

If you want to study abroad, we'll help you do it. For example, participate in the Global Educational Exchange program and collaborate with researchers at Peking University in China, or complete a full semester at one of our partner universities, like the National University of Singapore. Your options are unlimited: study physics in New Zealand, or neuroscience in Brazil. Link up with global contacts and gain an edge in the workforce—many industries now demand international experience and cross-cultural competency.

88
Engineering student clubs

A WEEK IN THE LIFE OF A FIRST-YEAR ENGINEERING STUDENT

You'll have about 25 hours of class per week as a U of T Engineering student. That leaves you with enough time to study, stay healthy and get involved in clubs and activities outside of the classroom. Here's a quick look at what your week might look like when you start at U of T Engineering.

Note: This timetable reflects the schedule of a first-year Electrical Engineering student.

PEY: MORE THAN A CO-OP

Halfway through your degree, you'll have the opportunity to participate in the Professional Experience Year (PEY) program. Created in 1979, PEY is the most highly regarded paid internship in the country. PEY is a full-time engineering job that lasts 12 to 16 months. Each year, students have access to more than 1,000 PEY positions. Over 70 per cent of graduating U of T Engineering students do a PEY internship.

PEY goes far beyond a traditional work experience program, where jobs usually last four months—just about the length of a summer job and barely enough time to learn the ropes. PEY helps you understand the practical side of your studies, gives you insight into your own interests and helps you develop your skills as an engineer. You'll be treated as a professional, working with diverse teams and responsible for managing and spearheading key projects.

The U of T Engineering brand carries a lot of weight with employers. Major organizations like Deloitte, Environment Canada, Imperial Oil, Husky Injection Molding Systems Ltd., Holcim, Canadian Imperial Bank of Commerce (CIBC), Bell Canada, IBM and Apple routinely hire PEY students, as do start-up and medium-sized companies. Notable amongst the start-up community are Uken Games, Colibri Technologies Inc., and Wattpad.

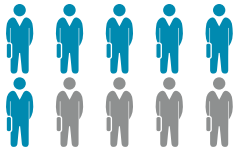
Your PEY experience can also take you abroad; last year, 60 international engineering internships took place with companies like Marin Software and Microsemi Corporation. Consistent international hires come from Agfa Graphics in Belgium, CLP Power Hong Kong and Alstom Power in Switzerland, with new international hires from Bank of New York Mellon in Amsterdam and Air Liquide Sante International in France.

PEY QUICK FACTS

PEY placements are available locally, nationally and internationally.

$47,000 AVERAGE SALARY

On average, students on PEY earn a salary of $47,000. In 2013, the highest PEY salary was $72,800.



Over 60 per cent of returning PEY students will accept job offers prior to graduation.

+15% STARTING SALARY

On average, new grads with PEY experience can negotiate a starting salary at their first full-time job that is 15 per cent higher than those without PEY experience.

704
Engineering students did a PEY internship in 2013-2014

DIMPHO'S STORY

"Working as a process analyst at CIBC for PEY was an amazing experience. I was challenged as well as given the opportunity to demonstrate my knowledge through projects that I worked on. I developed skills in project management, process improvement and business analysis. PEY not only helped me launch my professional career with confidence, it also enabled me to improve my communication and networking skills.

Through PEY, I discovered a passion for understanding people and a desire to further develop my leadership skills, which I am doing by taking engineering leadership courses. What surprised me was how I could use these skills in other aspects of my life. I have been involved with the National Society of Black Engineers since first year and feel that I have gained experiences that prepare me to be a confident and successful president this year. I would highly recommend that students participate in PEY."

DIMPHO RADEBE, INDUSTRIAL ENGINEERING

HOW TO APPLY

When you apply to U of T Engineering, we carefully consider both your academic performance and activities outside the classroom. The application process consists of six steps:

1 REVIEW THE ADMISSION REQUIREMENTS

Admission requirements depend on what country you live in and your educational system. We pay special attention to your grades in prerequisite courses. If your education system is not listed in the table below, please use our online tool to determine your entry requirements: **www.adm.utoronto.ca**.

2 APPLY ONLINE

Visit **www.ouac.on.ca** and choose the correct application based on your situation: Ontario high school students should use Form 101; all other applicants use Form 105. Create an account, complete your application, pay the OUAC application fee and submit it prior to **January 30**. If you're a part-time or transfer student, please visit our website for more info on how to apply. **www.uoft.me/applyeng**

3 COMPLETE YOUR STUDENT PROFILE FORM (SPF)

After you apply through the OUAC, we will provide you with access to the **Engineering Applicant Portal**, where you will complete the mandatory **Student Profile Form (SPF)**. **The SPF is a required form; if you do not complete this form, your application will not be considered.** The SPF is your opportunity to help us better understand you as a person and your strengths outside the classroom. Applications are reviewed in the order that we receive the SPFs, so we encourage you to complete yours as soon as possible.

4 APPLY FOR RESIDENCE ONLINE

If you want to live in residence, complete the university's common residence application (MyRes) by **March 31**. This step allows you to tell the university which residences you want to live in. We'll send you more information on how to complete this application. Read about the Residence Guarantee at **www.uoft.me/engresidence**.

REQUIRED SECONDARY SCHOOL BACKGROUND*

CANADA

ONTARIO: English (ENG4U); Advanced Functions (MHF4U); Calculus and Vectors (MCV4U); Chemistry (SCH4U); Physics (SPH4U); and an additional U or M course

ALBERTA/NW TERRITORIES/ NUNAVUT: Pure Math 30; Math 31; Chemistry 30; Physics 30; and English 30 or ELA 30-1

BRITISH COLUMBIA/YUKON: Pre-Calculus 12; Calculus 12 or AP Calculus; Chemistry 12; Physics 12; and English 12

MANITOBA: Pre-Calculus Math 40S; AP Calculus; Chemistry 40S; Physics 40S; and ELA 40S

NEW BRUNSWICK: Calculus 120; PreCalculus B120; Chemistry 121 or 122; Physics 121 or 122; and English 120, 121 or 122

NEWFOUNDLAND/LABRADOR: Math 3200; Math 3208; Chemistry 3202; Physics 3204; and English 3201

NOVA SCOTIA: Pre-Calculus 12 or AP Calculus; Advanced Math 12 or Math 12; Chemistry 12; Physics 12; and English 12

PRINCE EDWARD ISLAND: Mathematics 621A or 621B; Mathematics 611B; Chemistry 611 or 621; Physics 621; and English 621

SASKATCHEWAN: Pre-Calculus 30; Calculus 30; Chemistry 30; Physics 30; and English ELA A30 + B30

QUEBEC CEGEP: 12 academic courses including one course in Pure & Applied Science, one course in Algebra, and two courses each in Calculus, Chemistry, Physics and English. 24 courses with prerequisites will be considered for advance standing credit.

INTERNATIONAL

AMERICAN SYSTEM: Grade 12 at an accredited high school, including senior level courses in Math, Chemistry and Physics, and SAT Reasoning Tests or ACT results. It is also recommended, but not required, that students submit either AP or SAT subject test results in Math, Chemistry and Physics.

BRITISH PATTERNED: Three A-Levels including Mathematics and Physics. Chemistry is strongly recommended as the third A-Level. Applicants are required to present at least AS-Level Chemistry.

INDIAN SYSTEM: Mathematics, Chemistry and Physics at the grade 12 level. Completion of the All India Senior School Certificate awarded by CBSE, or the Indian School Certificate awarded by CISCE, or Year 12 State Board Exams with excellent results.

INTERNATIONAL BACCALAUREATE (IB) DIPLOMA: Mathematics (recommended at higher level); Physics and Chemistry at either level.

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SUBMIT DOCUMENTS

To get a full picture of your academic history, we require your transcripts from every institution you attended from grade 9 to the present. We will let you know what we've received and what we still require (along with submission deadlines) through the Engineering Applicant Portal. We cannot consider your application until we have all supporting materials. Due to the additional document assessment time required, we encourage Form 105 applicants to submit applications and required documents as early as possible.

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CHECK THE STATUS OF YOUR APPLICATION REGULARLY

The best way for you to keep current on the status of your application is to check the Engineering Applicant Portal regularly. For Ontario high school students, most admissions decisions are made in three rounds: February, March and May. For non-Ontario high school students, decisions are made on an ongoing basis from January to May, with most decisions made between February and May.

ENGLISH FACILITY REQUIREMENTS

If your first language is not English, you must present proof of English facility prior to admission consideration, unless you have completed four years of full-time study in an English language school in a country where the predominant language is English. For applicants who are required to present proof of English facility and are taking grade 12 English (i.e., ENG4U), you must achieve at least a 60 per cent in this course. For details on required scores and acceptable tests, please visit **www.adm.utoronto.ca/eft**.

* U of T Engineering does not grant transfer credit for AP, IB or A-Level exams.

MONEY MATTERS

Below, you'll find basic information about costs and financial aid to get you started. We invite you to explore detailed information and resources on our website that will provide a more complete picture of financing your education.

FINANCIAL AID & SCHOLARSHIPS

All applicants to U of T Engineering are automatically considered for **admission scholarships**. These are awarded on the basis of academic excellence and, in some cases, financial need. At the end of your first, second and third years of study, you can apply for a range of **in-course scholarships**.

We are committed to ensuring that no admitted domestic student[1] is unable to enrol in or complete their studies due to lack of financial means. This commitment led to the creation of a unique financial aid program called **University of Toronto Advance Planning for Students (UTAPS)**. Through a non-repayable grant, UTAPS covers unmet financial need after a student has received a maximum amount of support through government assistance (e.g., OSAP for Ontario students).

COSTS

Fees for full-time studies are in Canadian dollars. For more information, please visit **www.fees.utoronto.ca**.

	DOMESTIC	INTERNATIONAL
Tuition	$12,980[2]	$43,540[3]
Incidental Fees	$1,475[4]	$1,475[4,5]
Residence & Meal Plan	$7,985-$17,645	$7,985-$17,645
Books & Supplies	$1,500–$2,000	$1,500–$2,000

1. International students are not eligible for need-based financial aid
2. 2014–2015 academic fees
3. 2015–2016 proposed academic fees (subject to Governing Council approval in the spring 2015)
4. 2014–2015 incidental fees; 2015–2016 fees are subject to change
5. International students are also required to purchase health insurance through UHIP (approximately $700 per year)

WORLD-CLASS FACILITIES

From the labs where innovation happens every day to the spaces where our students unwind, U of T Engineering's classrooms, services and research centres span 15 buildings on campus — all within walking distance of each other — and one (U of T's Institute for Aerospace Studies) off campus. For an interactive campus map, please visit **map.utoronto.ca**.

All information was correct at the time of printing. Please visit **www.discover.engineering.utoronto.ca** for all the latest information and updates.
Principle photography by Neil Ta and additional photography by Jacklyn Atlas, Roberta Baker, Sara Collaton, John Guatto, Mike Hawkins, David Moll and Blue Sky Solar Racing team.

TAKE A TOUR

The best way to experience U of T Engineering is to visit in person. We invite you and your family to explore our facilities and meet our students on a guided tour. Visit **www.uoft.me/tourengineering** to sign up.

Your tour will start in the **Engineering Welcome Centre**. We are located in the Galbraith Building, at 35 St. George Street, in room 173.

UNIVERSITY OF TORONTO | Engineering

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FACULTY OF APPLIED SCIENCE & ENGINEERING

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