ANNUAL REPORT 2016

PERFORMANCE INDICATORS

UNIVERSITY OF TORONTO | Engineering

Pictured on the front cover (top to bottom):

Professor Craig Simmons is the Scientific Director of the Translational Biology and Engineering Program (TBEP). TBEP is the University of Toronto's component of the Ted Rogers Centre for Heart Research (TRCHR) and brings together faculty members and their students from U of T Dentistry, Engineering and Medicine. Together, these researchers are advancing heart research, diagnostics, and regeneration using a comprehensive approach that includes systems and developmental biology, technology innovation and clinical translation.

On May 13, 2016 more than 1,400 students and teachers from across the Greater Toronto Area converged on U of T Engineering for Innovate U. The one-day workshop was Canada's largest science, technology, engineering and math (STEM) event for children in Grades 3 to 8. Innovate U was run in partnership with Google Canada and Actua, a national STEM charity.

Two students from U of T Engineering work on the Formula SAE racing car. Students can choose from more than 90 engineering clubs and teams, from design and competition groups such as the Human-Powered Vehicle Team to cultural and arts groups such as Skule™ Orchestra, as well as national organizations such as Engineers Without Borders.

Currently under construction, the Centre for Engineering Innovation & Entrepreneurship (CEIE) will set a new standard for engineering education and research. When the CEIE opens in 2017, it will provide a new home for some of our world-leading institutes, such as the Centre for Global Engineering and the Institute for Sustainable Energy. Its design/meet rooms and fabrication facilities will enable students, faculty and industry partners to collaborate across disciplines on complex global challenges and launch new companies to bring their innovations to market.

Message from the Dean

I am delighted to present the *2016 Annual Report of Performance Indicators*.

Our Faculty's commitment to excellence relies on data-driven decision making. Our performance indicators and related metrics are powerful tools that enable us to assess progress, identify our strengths and challenges, set measurable goals and fine-tune our actions when required. They point us to new directions and priorities that will strengthen our position as the premier engineering school in Canada and one of the world's best. The data and highlights in this document demonstrate our tremendous achievements over the past 12 months — the final year of our *Academic Plan 2011–2016*.

We had much to celebrate in 2015–2016. Our outstanding undergraduate programs, unparalleled co-curricular opportunities and exceptional reputation, combined with strategic recruitment initiatives, enabled us to draw a record number of applications. Our 2015 entering undergraduate cohort included students who excel in academics as well as entrepreneurship, global engagement, community service, athletics and the arts. It was one of the most diverse first-year classes in our history: nearly one-third of students came from outside of Canada and 31.4 per cent were women. This figure was surpassed once again in 2016 with women comprising 39.2 per cent of the incoming cohort.

Our enhanced programming and world-renowned professors attract brilliant graduate students from across Canada and around the world. These students choose U of T Engineering for the opportunities to conduct innovative research, work with pioneers in our engineering fields and join a rich and diverse community. Over the past decade, we have increased the number of students in our PhD program by 58 per cent. Through the development of vibrant programs, including specializations in Sustainable Energy, Robotics & Mechatronics, and Engineering & Globalization, we have grown the number of full-time equivalent MEng students by 600 per cent.

Our exceptional researchers are addressing major global challenges, from improving human health to advancing sustainability and clean energy. In 2015–2016, a team of U of T Engineering researchers created a platform for growing human tissues outside the body that will enhance drug safety and could one day enable the repair of damaged organs with lab-grown replacements. Another team created a catalyst with record-setting efficiency that could improve the storage of renewable energy sources, such as solar and wind. We also played a key role in multidisciplinary research initiatives at the intersection of engineering, medicine and clinical practice that have the potential to revolutionize health care. As a result of our collaborative approach and the depth and breadth of our expertise, we further strengthened our research support, including a record amount of Tri-Council funding and corresponding proportion of Canada Research Chairs.

We continue to earn recognition at the highest levels for our excellence in research and teaching. This past year, U of T Engineering faculty won more than 20 per cent of major national and international awards received by Canadian engineering professors, including the Killam Prize and honours from the Royal Society of Canada and the U.S. National Academy of Engineering. Our professors also received the Ontario Confederation of University Faculty Associations Teaching Award and a President's Teaching Award in recognition of remarkable innovations and commitment to education.

In 2015–2016, we have enhanced experiential learning opportunities that enable students to develop key competencies in engineering, leadership and global fluency. Whether they are designing the world's fastest bicycle or building a wind-powered irrigation system for farmers in Central America, our students are creating solutions with global impact. They are also launching startups with support from our rich ecosystem of entrepreneurship accelerators, including Start@UTIAS and The Entrepreneurship Hatchery. These formative experiences, combined with a strong technical foundation in engineering, prepare them to be the next generation of innovators, makers and leaders.

The Centre for Engineering Innovation & Entrepreneurship (CEIE) will be a vibrant hub that will set a new standard for engineering education and research when it opens in 2017. It will provide a new home for some of our world-leading institutes, such as the Centre for Global Engineering and the Institute for Sustainable Energy. Its design/meet rooms and fabrication facilities will enable students, professors and industry collaborators to work together across disciplines on complex global challenges and bring their innovations to market. In 2015–2016, the CEIE received new support from the U of T Engineering community and beyond, including a $15 million investment from the Government of Ontario.

I am proud of our shared achievements and the bright future we are building together as we strengthen our leadership in engineering education and research. On behalf of the Faculty, I thank you and our entire community for your tremendous contributions and inspiring commitment to our unwavering pursuit of excellence.

Cristina Amon, Dean
September 2016

Faculty Leadership, 2015–2016

Dean
Cristina Amon

Vice-Dean, Graduate Studies
Markus Bussmann

Vice-Dean, Research
Ted Sargent

Vice-Dean, Undergraduate
Thomas Coyle

Associate Dean, Cross-Disciplinary Programs
Bryan Karney

Chair, First Year
Micah Stickel

Director, University of Toronto Institute for Aerospace Studies
David Zingg

Director, Institute of Biomaterials & Biomedical Engineering
Christopher Yip

Chair, Department of Chemical Engineering & Applied Chemistry
Grant Allen

Chair, Department of Civil Engineering
Brent Sleep

Chair, The Edward S. Rogers Sr. Department of Electrical & Computer Engineering
Farid Najm

Chair, Division of Engineering Science
Mark Kortschot

Chair, Department of Materials Science & Engineering
Jun Nogami

Chair, Department of Mechanical & Industrial Engineering
Jean Zu

Assistant Dean, Administration
Lisa Camilleri

Chief Financial Officer
Brian Coates

Executive Director, Advancement
Gillian Sneddon

Executive Director, Communications
Catherine Riddell

Faculty Registrar
Don MacMillan

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Selected Achievements Under the Academic Plan

The Faculty of Applied Science & Engineering's five-year *Academic Plan 2011–2016* provides the framework that guides our vision to be a leader among the world's best engineering schools. Approved by Faculty Council in October 2011, the Academic Plan was developed through a highly consultative planning process involving faculty, staff, students, alumni and University stakeholders.

In the final year of the Academic Plan, we have made tremendous progress in achieving, and in many cases exceeding, our ambitious goals in seven key areas: positioning; culture of excellence; educating future engineers; student experience; research foci; outreach, collaboration and influence; and resource allocation.

The full Academic Plan is available at: uoft.me/engacademicplan, and our Year Four: Progress and Achievements report is available at: uoft.me/yearfourprogress

Positioning

Our position as a leader among the top global engineering schools is strengthened by the compelling stories we publish about our advances in research and engineering education. Our communications strategies leverage high-quality printed materials, engaging websites and social media, and even public art. In 2015–2016, we enhanced all of these areas and won seven international awards for communications.

Progress Highlights

- Earned recognition as the premier engineering school in Canada and among the best in the world across all international rankings in 2015 — the only Canadian university to rank in the top 25 schools globally in the Shanghai Jiao Tong Academic Ranking of World Universities (ARWU) for Engineering/Technology and Computer Sciences, and the Times Higher Education (THE)–Elsevier World University Ranking for Engineering and Information Technology.
- Secured more than 3,400 media stories in the strategic priority areas of Bioengineering/Health, Sustainability, Information and Communication Technology, Engineering Education, and Entrepreneurship and Commercialization. Nearly 60 per cent of these stories appeared in international outlets.
- Created a 276-foot-long graffiti installation on the site of the Centre for Engineering Innovation & Entrepreneurship (CEIE) to inspire a public conversation about the contribution of engineering to society and the accomplishments of our Faculty. The accompanying CEIExSKAM media campaign garnered 12 media stories with 5.5 million impressions, 5,000 visitors at Scotiabank Nuit Blanche, more than 282,900 social media impressions and a Gold Quill Award of Excellence from the International Association of Business Communicators.
- Expanded user engagement with our social media channels: Facebook engagements grew 447 per cent and Twitter engagements grew by nearly 600 per cent over the previous year. In January 2016, we relaunched our Instagram channel with a new focus on engineering student life and our vibrant engineering community, doubling our followers to more than 1,200 by June 2016.
- Published 220 stories on U of T Engineering News, generating 199,555 page views, up 74 per cent from the prior year.

Culture of Excellence

We recruit from among the best and brightest students from Canada and around the world, and we continue our commitment to increasing diversity in all its forms within the engineering profession. Our standard of excellence in research and education is reflected in the calibre of our faculty, students and alumni and the recognition we consistently receive at the national and international levels.

Progress Highlights

- Earned 21 per cent of major national and international awards received by engineering professors in Canada — twice as many as any other Canadian engineering school — with U of T Engineering professors accounting for only 5.5 per cent of total engineering faculty members in Canada.
- Performed an internal review of the Cross-Disciplinary Programs Office, which coordinates undergraduate minors. The review indicated that the office is fulfilling its mandate and ensuring that students benefit from these unique programs.
- Conducted external reviews of UTIAS, EngSci and ChemE during 2015–2016, all of which spoke highly of the calibre of our programs and students, as well as the excellence and dedication of our faculty and staff.
- Hired nine outstanding women professors who embody our values of excellence in research and teaching, cross-disciplinary collaboration and diversity, with five accepting budgetary cross-appointments in two academic units.
- Implemented the second phase of our broad-based admissions system, which leverages a video profile and written essays and accounts for students' first choice of school as well as extra-curricular activities. Together, these measures provide a more comprehensive understanding of each applicant's candidacy than grades alone.
- Created the position of Director, Engineering Pathways and Indigenous Partnerships to coordinate Faculty-led outreach to increase participation and academic success of Indigenous students in Engineering.
- Created the Percy Edward Hart and Erwin Edward Hart Professorships from proceeds of a $20-million endowment to accelerate the research and educational contributions of seven faculty members within the first 10 years of their careers and provide enhanced support for graduate students.

Educating Future Engineers

We continue to nurture the next generation of global engineering leaders by providing educational programs that are recognized for excellence around the world. In 2015–2016, we further enhanced our leading-edge offerings with new options that help students develop their competencies in high-demand sectors. We also strengthened our support for incoming students as they transition to the engineering academic environment.

Progress Highlights

- Launched a new Engineering Science major in Robotics Engineering, championed by several engineering departments and the Department of Computer Science. Student interest in this program has been tremendous, with 66 students entering this major in 2016–2017, double the size of the first cohort in 2015–2016.
- Welcomed the first undergraduate students into the new Nanoengineering minor, and the Engineering Communication certificate, as well as the new MEng emphasis in Advanced Manufacturing.
- Increased the proportion of our graduating class to complete a minor or certificate to 55 per cent, including 34 per cent who completed either a minor or certificate in Engineering Business.
- Created a new first-year course — APS100 Orientation to Engineering — which consists of lectures as well as tutorials led by upper-year undergraduate TAs, to help students transition into U of T Engineering.
- Increased the proportion of MEng students within overall professional master's enrolment to 54 per cent, surpassing our goal as set out in the Academic Plan.
- Doubled enrolment in the collaborative graduate program in Engineering Education, first launched in 2014, to 12 graduate students.
- Attracted five applications for every space in new Master of Engineering (MEng) in Biomedical Engineering program, set to launch in fall 2016. Eleven students were accepted, seven of whom are domestic.

Student Experience

Both inside and outside of class, U of T Engineering offers unparalleled opportunities for students to develop competencies in leadership, communication, multidisciplinary collaboration and cross-cultural fluency. Our innovative courses and internships provide valuable experience addressing major industrial challenges, while our co-curricular programs enable students to pursue their passions, including developing startup companies.

Progress Highlights

- Placed 790 students — the largest cohort yet — in Professional Experience Year (PEY) internships with leading companies, including 79 outside of Canada.
- Addressed industrial challenges for Bombardier, Defence Research & Development Canada, Astronauts for Hire and other organizations through the University of Toronto Institute for Multidisciplinary Design and Innovation (UT-IMDI), including through internships and the Multidisciplinary Capstone Project (MCP) course.
- Expanded the number of online courses to four: APS 160 Mechanics; APS 162 and 163 Calculus for Engineers; and APS 164H1 Introductory Chemistry from a Materials Perspective. We also offered a calculus "boot camp," which gave entering students an opportunity to review key mathematical concepts and see how they are applied to university-level calculus in the summer before their first year.
- Increased first- to second-year retention rate to 96.8 per cent in 2015 — a record achievement. This accomplishment reflects the high calibre of our students and our robust programs that support student success.
- Launched a new Faculty-wide Summer Leadership Program through ILead, an eight-week course that provides summer research students with opportunities to better understand their strengths and values and gain new perspectives on engineering and its impact on society. ILead also added four new complementary studies courses in subjects from engineering leadership to positive psychology.
- Celebrated the launch of several companies that received support from one or both of our entrepreneurship accelerators, Start@UTIAS and The Entrepreneurship Hatchery. Kepler Communications, MedChart, Pillsy and TeleHex all received funding from the Ontario Centres of Excellence's SmartStart Seed Fund. teaBOT, a purveyor of customized, robot-blended cups of tea, opened its sixth North American location in Los Angeles.
- Commissioned two decanal task forces: one to review academic and student advising and the other on student mental health strategies. We also created two new committees: one to serve as an inclusive forum for discussion of ideas to ensure a welcoming and supportive atmosphere for Indigenous students, faculty, staff and communities, and the other to review and help implement the University's new policy on Information Security and the Protection of Digital Assets.

Research Foci

Our Faculty fosters world-leading, multidisciplinary research that addresses global challenges of the 21st century. We leverage our international reputation for excellence, cross-disciplinary collaboration and synergistic relationships with alumni, industry partners and governments to attract new support for research. Appropriate funding helps us to enhance the impact and reach of our innovations.

Progress Highlights

- Launched two new multidisciplinary research institutes: the Centre for Power & Information and the Centre for Aerial Robotics Research & Education.
- Enhanced our ability to attract major research awards by leveraging faculty experiences through panel discussions and an internal proposal review. One result was an increase in the success rate for Ontario Early Researcher Awards to 67 per cent in 2016 (up from 38 per cent in the previous competition). In 2015–2016 we also received two additional Strategic Project Grants, seven new or renewed Canada Research Chairs, and major awards from NSERC including the Brockhouse Prize and an E.W.R. Steacie Memorial Fellowship.
- Raised the level of Tri-Council support to $31.8 million from $29.1 million, bringing us close to our revised $32 million goal.
- Developed policies and guidelines to standardize practices across the Faculty, including Canada Research Chair allowances, and indirect cost recovery for service contracts.

Outreach, Collaboration & Influence

Our collaborations and outreach activities help us leverage our global community of alumni and partners to attract stellar students, enhance the support for and impact of our research, and build capacity for the future.

Progress Highlights

- Hosted Innovate U, Canada's largest science, technology, engineering and math (STEM) event for children in Grades 3 to 8. This one-day workshop, held on May 13, 2016, was run in partnership with Google Canada and Actua. It attracted more than 1,400 students and teachers from across the GTA.
- Intensified our international student recruitment in the U.S., Latin America, and the Middle East; awarded international scholarships of full tuition to students from underrepresented countries (U.S., Bangladesh, Turkey, and New Zealand).
- Held the second annual Young Women in Engineering Symposium (YWIES) in October 2015, which attracted top female Grade 12 science students from across the Greater Toronto Area to learn more about engineering and meet our students, faculty and alumni.
- Formalized agreements with Shanghai Jiao Tong University and Tianjin University for incoming students (MASc and fourth-year students, respectively) to obtain our MEng. We also expanded the number of partners in our international capstone design course to include Tsinghua University along with existing partners Peking University (PKU), the National University of Singapore (NUS) and the University of California, Irvine.
- Increased the number of students completing summer research abroad to 76 in 2016–2017 from 64 in 2015–2016, and the number of international Professional Experience Year internships to 79 from 61 in 2015–2016.
- Attracted $29.3 million in philanthropic gifts in 2015–2016, bringing our fundraising for Boundless: The Campaign for the University of Toronto to $180 million, or 90 per cent of our $200-million goal.
- Rolled out the Graduway alumni network social media platform across three departments, with two more expected to launch in 2017. Graduway enhances our ability to connect with our global community of alumni and improves engagement, including mentorship and volunteer opportunities. It also provides us with key data on industry affiliations.
- Launched our first Spring Reunion Giving campaign in 2016, including both online and direct mail giving options.

Resource Allocation

Our resources have a direct impact on our ability to achieve the ambitious goals in our Academic Plan. In 2015–2016, we creatively and strategically leveraged our resources, including budget, space, infrastructure and personnel, to achieve our goals.

Progress Highlights

- Continued construction of the CEIE and established four multidisciplinary implementation groups to plan for the CEIE's new spaces and consult on key design decisions. These groups were composed of professors, students and staff from all departments, divisions and institutes and addressed four key aspects of the building: rapid prototyping and fabrication facilities, TEAL and design/meet rooms, research centres and student club space.
- Funded 15 projects through the Dean's Strategic Fund, including expansion of the MIE machine shop and growth of the Southern Ontario Centre for Atmospheric Aerosol Research (SOCAAR). We also initiated a call for proposals for the Dean's Infrastructure Improvement Fund.
- Completed the development of an Interdivisional Teaching Agreement with the Faculty of Arts & Science that enables our Faculties to work together more effectively, and have now moved into the implementation phase.
- Grew total revenue in 2015–2016 by 6.3 per cent over the previous year, driven by increased research funding and higher student enrolment, particularly among international students.
- Completed the $10-million laboratory for the Translational Biology and Engineering Program (TBEP) in the MaRS Discovery District West Tower, part of the Ted Rogers Centre for Heart Research.
- Established a working group to review the Faculty's makerspaces. Its mandate includes identifying current capabilities and evaluating how they will be complemented by new spaces in the CEIE, as well as addressing supervision and safety to expand the use of existing makerspaces.

Comparison of U of T Engineering with Ontario and Canada, 2015–2016

The table below compares U of T Engineering metrics against those of engineering Faculties in Ontario and Canada for 2015–2016. Within Canada, we awarded 7.3 per cent of all undergraduate engineering degrees, 10.2 per cent of all engineering master's degrees and 11.0 per cent of all engineering PhD degrees this past year.

Our internationally renowned scholars have received the single largest proportion of Natural Sciences and Engineering Research Council (NSERC) engineering funding in 2015–2016, despite the fact that they make up only 6.1 per cent of Canada's tenured and tenure-stream engineering professors.

	U of T Engineering	Ontario	U of T % of Ontario	Canada	U of T % of Canada
Undergraduate					
Enrolment (FTE)	4,745	36,921	12.9%	80,708	5.9%
Degrees Awarded	1,035	6,465	16.0%	14,131	7.3%
% Women	22.8%	18.8%		18.8%	
Master's (MEng, MASc and MHSc)					
Enrolment (FTE)	1,088	5,504	19.8%	13,481	8.1%
Degrees Awarded	631	3,057	20.6%	6,193	10.2%
% Women	26.0%	24.7%		24.5%	
Doctoral (PhD)					
Enrolment (FTE)	855	3,423	25.0%	9,104	9.4%
Degrees Awarded	152	619	24.6%	1,385	11.0%
% Women	29.6%	23.1%		22.0%	
Faculty					
Tenured and Tenure-Stream	226	1,566	14.4%	3,683	6.1%
Major Awards					
Major Awards Received	14	24	58.3%	67	20.9%
Research Funding					
NSERC Funding for Engineering	$29.8M	$122.6M	24.3%	$292.7M	10.2%

Note: Unlike data contained in the rest of this report, enrolment (Full-time Equivalent, or FTE) and degrees awarded are based on the 2015 calendar year and come from Engineers Canada. Faculty data (tenured and tenure-stream) are based on November 2015 counts by Engineers Canada. Major awards are based on the 2015 calendar year and NSERC research funding is based on the 2015–2016 grant year (April to March).

Comparison of U of T Engineering with St. George Campus and University of Toronto, 2015–2016

The following chart compares U of T Engineering with the University of Toronto based on key metrics for 2015–2016. Since our activities are concentrated on the St. George campus, we also present our relative metrics where available.

	U of T Engineering	St. George Campus	Engineering % of Campus	University of Toronto	Engineering % of U of T
Student Enrolment					
Undergraduate	5,565	38,575	14.4%	64,635	8.6%
Professional Master's (MEng and MHSc)	815	7,249	11.2%	7,726	10.5%
Research Master's (MASc)	563	2,760	20.4%	2,864	19.7%
Doctoral (PhD)	881	5,872	15.0%	6,171	14.3%
All Students	7,824	54,456	14.4%	81,396	9.6%
Degrees Awarded					
Undergraduate	1,050	7,765	13.5%	12,210	8.6%
Professional Master's (MEng and MHSc)	442	3,282	13.5%	3,565	12.4%
Research Master's (MASc)	238	1,349	17.6%	1,401	17.0%
Doctoral (PhD)	145	828	17.5%	864	16.8%
Total Degrees	1,875	13,224	14.2%	18,040	10.4%
Faculty and Staff					
Professoriate	249			2,839	8.8%
Administrative and Technical Staff	312			6,620	4.7%
Research Funding					
Sponsored Research Funding	$78.3M			$420.0M	18.6%
Industry Research Funding	$7.1M			$16.8M	42.6%
Space					
Space (NASMs)	64,524	627,751	10.3%	828,067	7.8%
Revenue					
University-wide Costs	$62.5M			$501.3M	12.5%
Total Revenue	$197.4M			$1,817.0M	10.9%

Note: Student enrolment is shown as of November 1, 2015. Degrees awarded are based on the 2015–2016 academic year. Professoriate includes tenured, tenure-stream and teaching-stream faculty members. Administrative and technical staff include full- and part-time staff. Research funding is based on the 2014–2015 grant year (April to March). Space is measured in Net Assignable Square Metres (NASMs). Revenue is based on the 2015–2016 U of T fiscal year (May to April).

The Centre for Engineering Innovation & Entrepreneurship

The Centre for Engineering Innovation & Entrepreneurship (CEIE) will set a new standard for engineering education and research, strengthening our Faculty's position as the premier engineering school in Canada and one of the world's best. Located at the heart of U of T's St. George campus, the CEIE will inspire new levels of cross-disciplinary collaboration and experiential learning that will accelerate innovation and prepare the next generation of global engineering leaders to address the world's greatest challenges. Thanks to the remarkable commitment and vision of our U of T Engineering community, as well as funding from the Ontario government, the CEIE will open in 2017, launching an extraordinary new era for our Faculty.

"By incorporating innovation in engineering education and smart building design, the CEIE will be one of the finest research and teaching environments of any engineering school in the world."

– **Meric S. Gertler,** President, University of Toronto

Sustainability

The CEIE will boast innovative sustainable design features that will make it one of the most energy-efficient buildings at U of T. Illustrated in the Floor-by-Floor Tour, the skylights will draw daylight deep into the building, reducing the need for artificial lighting, and rooftop photovoltaic cells will harness the sun's energy to generate 70 kWh of electricity each year. Advanced air delivery systems (shown on the diagram with blue and red arrows) and passive solar shading will help reduce heating and cooling costs, and rainwater will be collected for landscape irrigation. The CEIE will meet or exceed many of the Tier 2 Toronto Green Standard performance measures for sustainable site and building design.

"This state-of-the-art, energy-efficient building will not only provide 10 per cent more space, but also offer exciting new opportunities for creative invention and a new level of interdisciplinary collaboration."

– **Ron Venter,** Chair, CEIE Project Planning Committee, Professor Emeritus, Mechanical & Industrial Engineering and Clarice Chalmers Chair of Engineering Design

CEIE PROJECT MILESTONES

MAR 2012
47–55 St. George Street selected as the site of the CEIE. Project Committee formed.

SEPT 2012
Boundless campaign launched for U of T Engineering

JAN 2013
Project Planning Report finalized

APR 2013
Architects selected

Impact

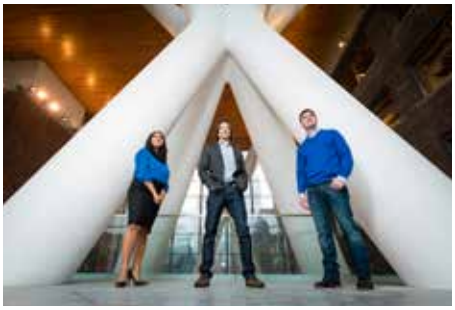
"The CEIE will allow us to take the next leap forward in the way we drive innovation, foster entrepreneurship and cultivate global engineering leaders."

– **Cristina Amon,** Dean, Faculty of Applied Science & Engineering

Student Experience

The CEIE will enrich the student experience by creating dynamic, flexible environments that enhance collaboration and experiential learning, including:

- Technology Enhanced Active Learning (TEAL) rooms with configurable tables and chairs serviced by multiple flat-panel screens;
- design rooms and fabrication facilities that will enable students to turn their ideas into working prototypes;
- a 500-seat auditorium featuring small-group seating and highly interactive learning and communications technology; and
- dedicated space for student clubs.



Regional Hub

U of T Engineering has a long history of nurturing exceptional researchers, students, and alumni entrepreneurs and leaders whose success contributes to the regional marketplace and enhances job and wealth creation in Toronto. The CEIE will combine some of the University's premier centres, institutes, incubators and industry partnership opportunities under one roof, providing our community with unparalleled resources to take ideas to market and strengthening Toronto's standing as one of the top 10 cities in the world for startups.

Global Reach

The CEIE will house both established and recently launched multidisciplinary institutes and research centres that bring together some of the most innovative minds across the Faculty and the University to address the world's greatest challenges, including sustainable energy, clean water and enabling technologies. The Faculty's ability to attract top students from around the world is due in part to the way these centres improve lives through creative engineering solutions.

To learn more about the Centre for Engineering Innovation & Entrepreneurship, please visit: uoft.me/CEIE

SEPT 2013
Design review committee assessment began

FEB 2014
Approval received from U of T's Governing Council

OCT 2014

Pilot TEAL room established in Sandford Fleming Building

Support

"The CEIE will transform our Faculty and will be an important legacy for future generations of engineers. This ambitious vision is coming to fruition thanks to the engagement, affinity and pride of our campaign donors, faculty, staff, students, alumni and friends, and the impeccable leadership of Dean Cristina Amon."

– **George Myhal (IndE 7T8),** Chair, U of T Engineering Campaign Executive Committee

The CEIE is an integral part of Boundless: The Campaign for the University of Toronto, which is raising $2 billion for Canada's leading research university. We have received more than $26 million in philanthropic donations to support the CEIE, including $1 million from undergraduates through the U of T Engineering Society. In addition, the Ontario government announced $15 million in funding for the CEIE in the 2016 budget, recognizing the key role the CEIE will play in advancing economic growth and accelerating innovation in the province.

The Faculty extends special thanks to donors who have supported the CEIE with contributions of $25,000 or more:

Anonymous (1)
Peter and Jocelyn Allen
Cristina Amon
Stewart L. Blusson
Brookfield
William P. Buckley
Paul M. Cadario
Choong Kong Chang
Robert Conway Chen
Water Chung-Wing Cheung
Class of 5T3 Engineering
Sydney and Florence Cooper
C. William Daniel
Kwong Wah Er
Patrick Yuk-Bun Fung
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Gooi Seong Heen
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Ian W. and Helen Hollingsworth
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Koh G. Yong
Albert Lam
Lee and Margaret Lau
The Lee Foundation
Ming Lim
Nick Lo
John Edgar McAllister
Murray R. Metcalfe
Dusan Miklas
Frank and Barbara Milligan
Walter Morris
George E. Myhal
The Estate of James Norris
Herbert Ross and Debra Pitman
Gillian Sneddon
Edward Swanston
James C. Tai
William and Kathleen Troost
University of Toronto Engineering Society
Carol Mitchell and Richard Venn
Bert Wasmund
John H Weber
The Estate of Isabel Blake Winnett
Henry King-cheong Wu
Philip L. K. Yeo

MAY 2015 — Rezoning approved by City of Toronto

JUNE 2015 — Groundbreaking ceremony

AUG 2015 — Creation of graffiti art installation CEIExSKAM on construction hoarding (uoft.me/CEIExSKAM)

OCT 2015 — CEIExSKAM participates in Scotiabank Nuit Blanche

FEB 2016 — $15M investment from the Province of Ontario

Floor-by-Floor Tour

"This building will encourage informal and spontaneous interaction, for it is often through chance encounters that innovation occurs and entrepreneurial thinking flourishes."

– **Robert Davies,** Principal, Montgomery Sisam Architects

Sixth Floor

- The Entrepreneurship Hatchery, U of T Engineering's in-house startup incubator
- Suite for visiting alumni

Seventh Floor

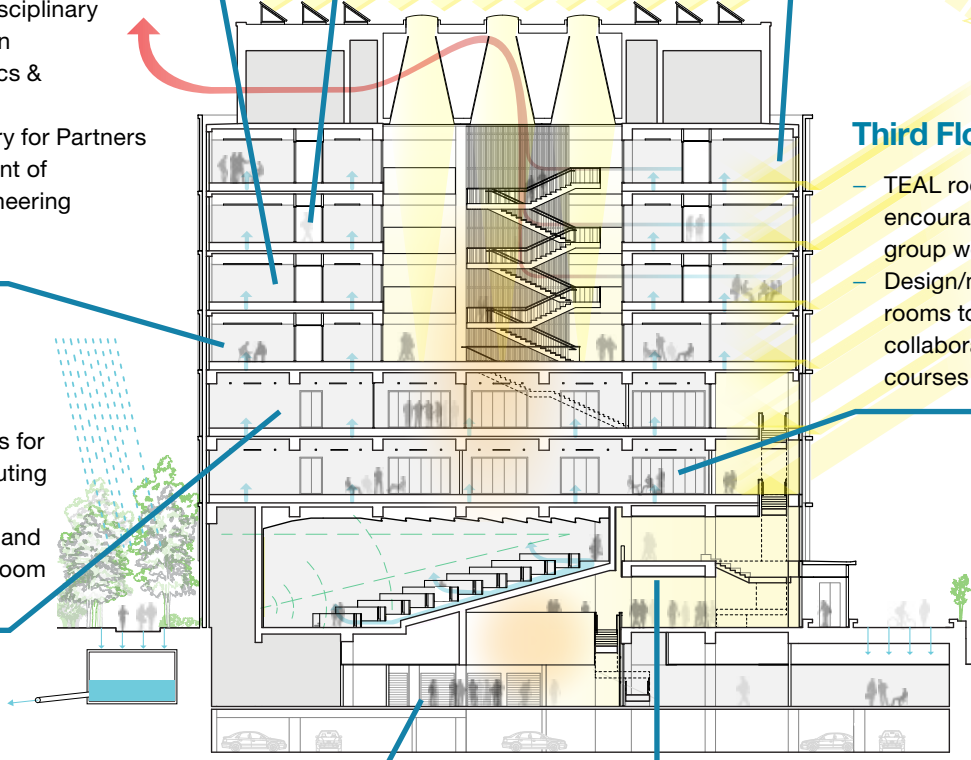
- Centre for Global Engineering
- Institute for Leadership Education in Engineering
- Collaborative research space
- Project rooms

Eighth Floor

- Institute for Sustainable Energy
- Institute for Water Innovation
- Collaborative research space
- Open-air terrace facing front campus

Fifth Floor

- Base level of a dramatic four-storey atrium and event space
- Institute for Multidisciplinary Design & Innovation
- Institute for Robotics & Mechatronics
- Research laboratory for Partners for the Advancement of Collaborative Engineering Education



Third Floor

- TEAL rooms to encourage dynamic group work
- Design/meet rooms to support collaborative courses

Fourth Floor

- Design/meet rooms for planning and executing group projects
- Fabrication facility and rapid prototyping room

First & Second Floors

- Grand hall and world-class event space
- Interactive 500-seat auditorium with a leading-edge data communications system, theatre-quality lighting and a stadium-style video wall

Lower Level

- Fabrication spaces, meeting rooms and storage for student clubs and teams
- Computer teaching laboratory
- Visualization facility with immersive screen technology

1

Our goal is to further strengthen our extraordinary programs, thereby advancing our standing as a global leader in engineering education and preparing our undergraduates to lead in a complex global engineering environment. We recruit outstanding students from around the world who excel not only academically, but also in diverse pursuits such as entrepreneurship, global citizenship, community service, athletics and the arts. These students choose U of T Engineering because of the excellence and breadth of our academic programs, our exceptional faculty members and the unparalleled co-curricular experiences we offer.

We received a record number of applications for our undergraduate programs in 2015 and selected one of the most accomplished entering classes in our history. For the second year, we used an enhanced broad-based admissions process that gives our admissions committee a more comprehensive understanding of each applicant's candidacy than one based on grades alone. This holistic picture allows us to recognize remarkable contributions both in and outside academic settings. We offer a range of resources to support student learning and well-being, and have struck two task forces to review and recommend improvements to mental health supports and to academic and student advising.

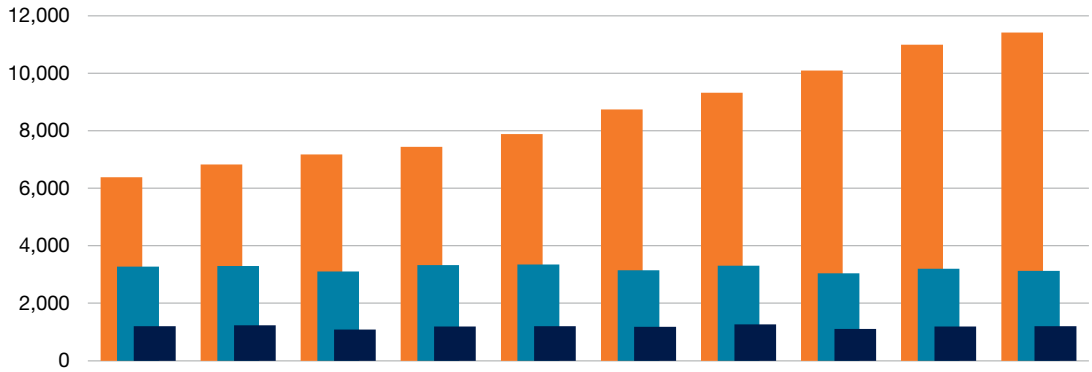
Our record of excellence, our inclusive environment and proactive recruitment strategies have made us a leader in advancing diversity among our students and in the engineering profession. In 2015–2016, our first-year class included the highest percentage of women in our Faculty's history. Our outstanding global reputation and recruitment strategies enable us to attract increasing numbers of international students, a group we are continuously working to further diversify. We are also intensifying efforts to improve access to engineering programs for Indigenous students and increase the number who apply to and enrol in our undergraduate programs.

We look forward to the opening of the Centre for Engineering Innovation & Entrepreneurship (CEIE) in 2017. The new Centre will enhance our undergraduate programming and student life by creating facilities that support innovative learning pedagogies, increase opportunities for experiential learning and offer purpose-built space for student clubs and teams.

Admissions and First-Year Students

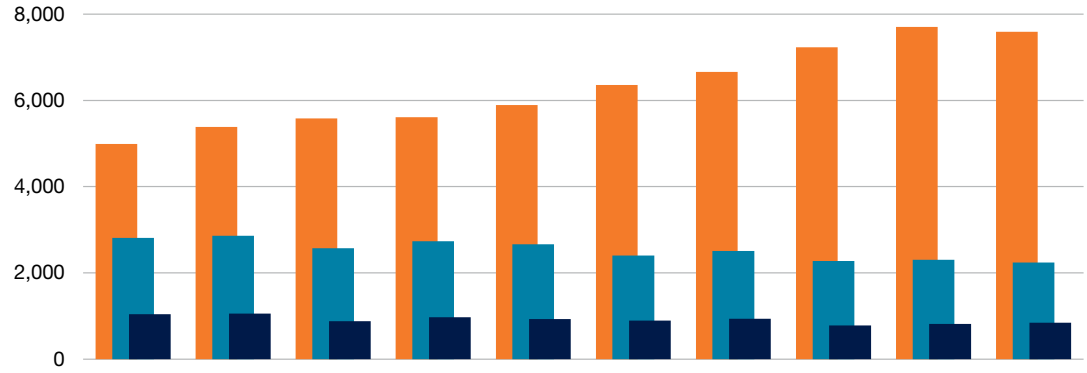
Our undergraduate programs continue to attract top students from across Canada and around the world. A record 11,418 candidates applied for admission in 2015, an increase of four per cent from the previous year and nearly 80 per cent from a decade ago. Applications from international students grew by 17 per cent year over year and have nearly tripled over the past 10 years, demonstrating our growing global reputation and the success of our international recruitment strategy.

Figure 1.1a Applications, Offers, Registrations, Selectivity and Yield of First-Year Undergraduates, 2006 to 2015



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Applications	6,383	6,829	7,173	7,446	7,881	8,745	9,326	10,095	10,989	11,418
Offers	3,276	3,300	3,107	3,329	3,347	3,149	3,309	3,042	3,203	3,126
Registrations	1,200	1,229	1,081	1,188	1,203	1,180	1,265	1,106	1,192	1,205
Selectivity	0.51	0.48	0.43	0.45	0.42	0.36	0.35	0.30	0.29	0.27
Yield	0.37	0.37	0.35	0.36	0.36	0.37	0.38	0.36	0.37	0.39

Figure 1.1b Applications, Offers, Registrations, Selectivity and Yield of Domestic First-Year Undergraduates, 2006 to 2015

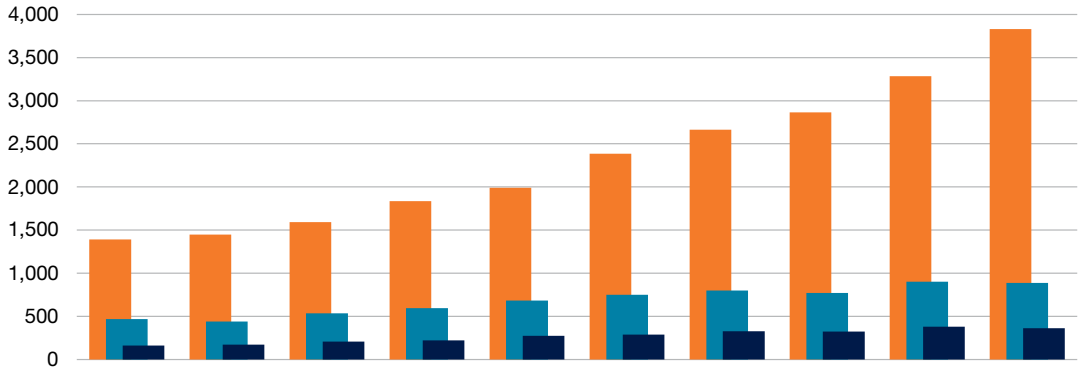


	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Applications	4,991	5,383	5,581	5,612	5,892	6,359	6,662	7,229	7,705	7,588
Offers	2,809	2,860	2,572	2,733	2,665	2,400	2,510	2,272	2,302	2,239
Registrations	1,040	1,056	876	967	931	894	938	782	812	843
Selectivity	0.56	0.53	0.46	0.49	0.45	0.38	0.38	0.31	0.30	0.30
Yield	0.37	0.37	0.34	0.35	0.35	0.37	0.37	0.34	0.35	0.38

Data in this chapter are presented by academic year (September to August). Highlights are from July 2015 to June 2016.
Note 1.1a, b, c: Student counts are shown as of November 1. Applications and offers are for the fall admissions cycle. Selectivity = offers ÷ applications and represents the proportion of applicants who were offered admission. Yield = registration ÷ offers. Domestic students are defined as citizens (living in Canada or abroad) or permanent residents of Canada.

Strong demand for our programs enabled us once again to increase both our selectivity and the proportion of admitted students who accepted our offers. In 2015, we offered admission to only 27 per cent of applicants, with 39 per cent of admitted students ultimately enrolling. In making admissions decisions, we carefully consider candidates' academic records, as well as non-academic accomplishments such as co-curricular involvement and leadership experience. For the second year, we also assessed applications using an enhanced broad-based admissions process that employs videos and timed, written responses to evaluate key engineering qualities, such as logical thinking, communication skills, adaptability and perseverance. This process gives us a more complete view of each applicant and enables us to select candidates who will best thrive in our enriched learning environment. To evaluate the effectiveness of this initiative, we are working with colleagues at the Ontario Institute for Studies in Education to correlate admissions scores with student success in the first year of studies.

Figure 1.1c **Applications, Offers, Registrations, Selectivity and Yield of International First-Year Undergraduates, 2006 to 2015**



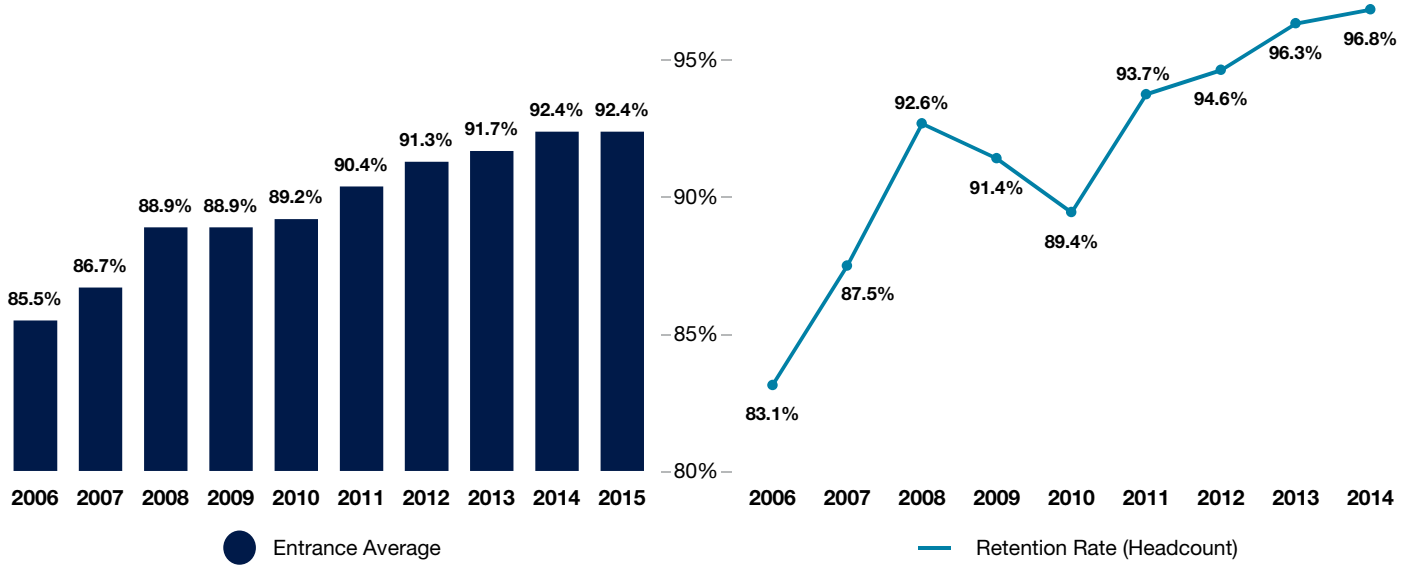
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Applications	1,392	1,446	1,592	1,834	1,989	2,386	2,664	2,866	3,284	3,830
Offers	467	440	535	596	682	749	799	770	901	887
Registrations	160	173	205	221	272	286	327	324	380	362
Selectivity	0.34	0.30	0.34	0.32	0.34	0.31	0.30	0.27	0.27	0.23
Yield	0.34	0.39	0.38	0.37	0.40	0.38	0.41	0.42	0.42	0.41

As a result of our strong global rankings, rigorous admissions process and targeted recruitment strategies, our 2015 entering class is one of the most accomplished in our history. The mean entering average of incoming Ontario secondary school students was 92.4 per cent, matching the previous year's record.

Our first-year class was also one of the most diverse in our history. Continuing pre-university outreach activities and targeted recruitment efforts, the percentage of women in our first-year class grew to a record 31.4 per cent. This is the second year in a row that women have comprised more than 30 per cent of our first-year students. International students continued to make up a significant proportion of our entering class, at 30 per cent, and the new International Scholar Award enhanced our ability to attract the very best students from abroad. We also admitted 29 students into the International Foundations Program, which allows academically strong students who do not meet the University's minimum English proficiency requirements to receive a conditional offer of admission as non-degree students while they improve their English-language skills. *(For further discussion of our achievements in these areas, please see Chapter 9: International Initiatives and Chapter 10: Diversity.)*

Our first- to second-year retention rate increased to 96.8 per cent in 2015, a new high, due to the academic strength of our students and our robust programs that support their success. *For more details, please see "Enriching the Undergraduate Engineering Experience."*

Figure 1.2 Ontario Secondary School Averages of Incoming First-Year Undergraduates and Retention Rate Between First and Second Year, 2006 to 2015



We strengthened our recruitment activities to enhance our ability to attract the brightest students from around the world. For the 2016 admissions cycle, key initiatives included:

- **National Recruitment** — We doubled the number of school visits in the Greater Toronto Area to 60 schools from 30 in 2014–2015. The schools were selected on the basis of historic admission data, with an eye to our enrolment priorities. We also conducted recruitment activities in Ottawa, Montreal, Vancouver and Calgary. As a result of these efforts, we increased both our Ontario and our out-of-province applications by nine per cent compared with 2014–2015.
- **International Recruitment** — We conducted extensive recruitment activities including school visits, applicant events, information sessions, conference presentations, and science fair participation in 13 countries. These included both established and emerging markets in the U.S. (California), South Asia (India, Sri Lanka, Singapore, Malaysia), Latin America (Brazil, Ecuador, Colombia, Peru, Costa Rica, Panama), the Caribbean (Trinidad) and the Middle East (Dubai, Turkey). As a result of our activities, we increased international applications by nine per cent compared with 2014-2015.
- **Online Events** — We hosted 15 livestreamed events and live chats throughout the admissions cycle to answer applicants' questions, promote our March Break Applicant and Welcome to Engineering events, and help students who accepted our offers plan for their first year of engineering studies. These events were highly successful and reached a total audience of more than 2,000 students.
- **Redesigned Offer Package** — We redesigned our offer package to make it more visually attractive and increase the excitement among successful applicants to U of T Engineering. We also built a new microsite for admitted students to provide further information about our programs, student life and next steps.
- **Young Women in Engineering Symposium (October 2015)** — After the success of the inaugural Young Women in Engineering Symposium (YWIES) in 2014, we held the event again in 2015, inviting more than 100 top female Grade 12 science students from across the Greater Toronto Area. The event gave attendees an opportunity to learn more about engineering, participate in hands-on workshops and meet students, faculty and alumni. It also enabled us to connect with these students early in the 2016 admissions cycle. To build on this engagement, we piloted a mentorship program from February to April 2016 that connected YWIES participants with current female U of T Engineering students.
- **Reading Week Calling Campaign (February 2016)** — Current U of T Engineering students called nearly 3,000 applicants across Canada to answer their questions

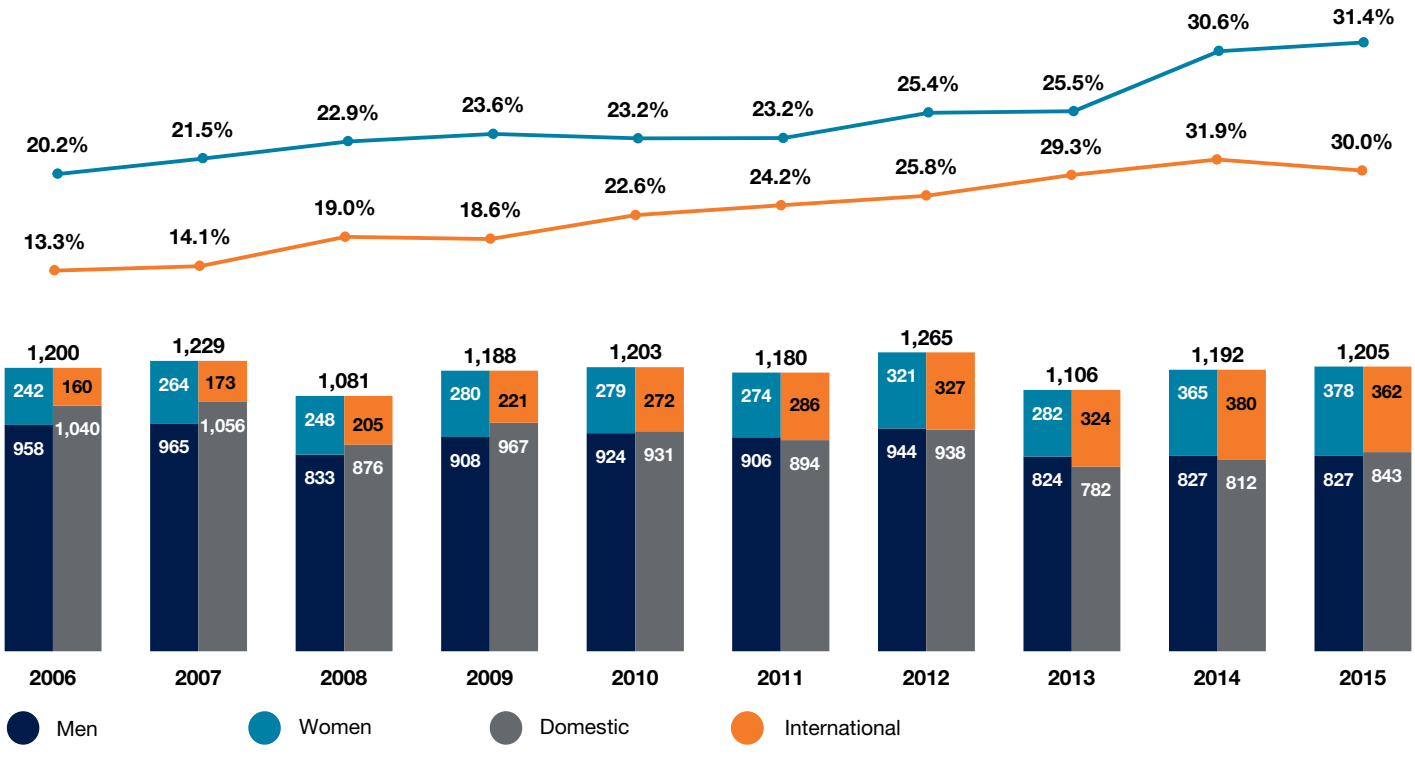
Note 1.2: Entrance average is calculated based on Ontario secondary school students. First- to second-year retention rate is indicated above year of first-year enrolment and is calculated as of November 1.

about our Engineering programs.

- **Alumnae Calling/Postcard Campaign (March/April 2016)** — This campaign connected more than 100 admitted female students across Canada and the United States with U of T Engineering alumnae who live in their regions.
- **March Break Applicant Event (March 2016)** — This invitation-only open house gave 600 applicants and their families an opportunity to learn more about the Faculty, specific programs, student life and our campus.
- **Girls' Leadership in Engineering Experience (GLEE) (May 2016)** — This annual, weekend-long program empowers and inspires women who have received offers of admission to our programs by connecting them with female faculty members, students and alumnae. Ninety-one per cent of the 87 students participating in GLEE accepted our offers of admission.
- **Welcome to Engineering (May 2016)** — This full-day event gave admitted students an opportunity to learn more about U of T Engineering before the final deadline for applicants to accept offers from Ontario universities. About 250 admitted students attended this event.

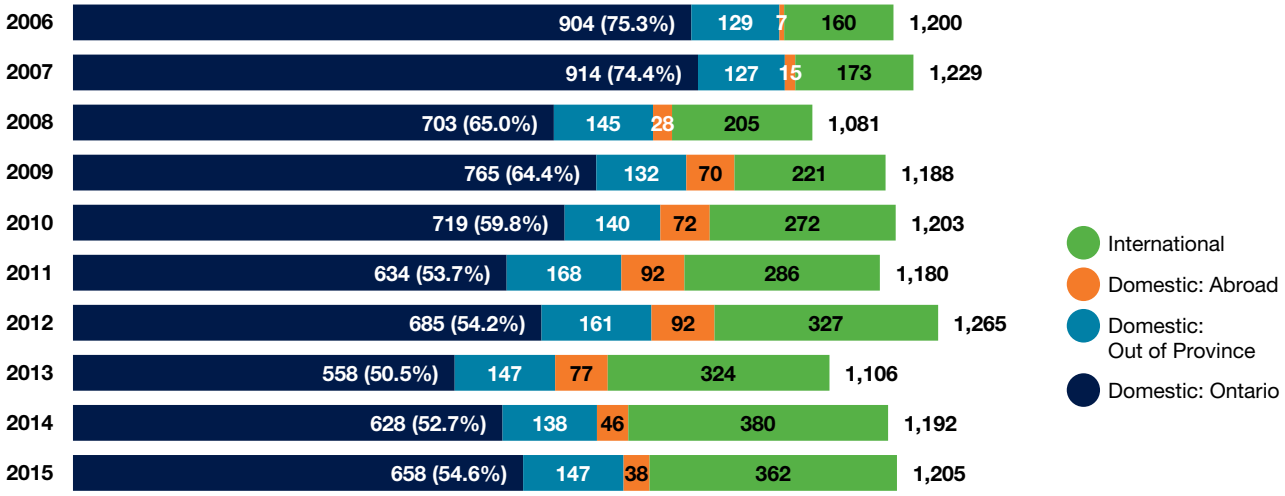
We are committed to addressing the Truth and Reconciliation Commission of Canada's call to eliminate educational gaps between Indigenous and non-Indigenous Canadians. In 2016, we created a new Director of Engineering Pathways and Indigenous Partnerships position to coordinate a Faculty-led outreach program to First Nations, Métis and Inuit communities, with the goal of increasing the rate of participation and academic success of Indigenous students in Engineering. The Director is also facilitating greater integration of outreach, recruitment and retention initiatives, both within the Faculty and across the University, that impact Indigenous engineering students. *(For more information on these initiatives, see Chapter 10: Diversity.)*

Figure 1.3 **Incoming First-Year Undergraduates with Percentage of Women and International Students, 2006 to 2015**



Note 1.3: Student counts are shown as of November. 1. Domestic students are defined as citizens or permanent residents of Canada.

Figure 1.4 **Incoming First-Year Domestic and International Undergraduates, 2006 to 2015**



Enrolment

The proportion of women across our undergraduate population increased to 27.4 per cent in 2015–2016 as the number of female students in our entering class continues to grow. Nearly every undergraduate program is seeing gains in female students. With women comprising more than 30 per cent of our first-year class for the second year in a row, we expect our overall undergraduate cohort to surpass that threshold within a few years. We play an active role in a broad national coalition that aims to increase the percentage of newly licensed engineers who are women to at least 30 per cent by 2030.

We also saw continuing growth in the proportion of international students across our undergraduate programs after we surpassed our Academic Plan goal of 25 per cent in 2014–2015. International students now comprise 27.4 per cent of our undergraduates, enriching our student body with diverse perspectives and expanding our global U of T Engineering community.

Overall enrolment was strong across all our undergraduate programs, with increases in CompE, General First Year, ChemE, EngSci and IndE.

Note 1.4: Student counts are shown as of November 1. Domestic students are defined as citizens or permanent residents of Canada.

Figure 1.5a **Undergraduate Enrolment with Proportion of Women and International Students, 2006–2007 to 2015–2016**

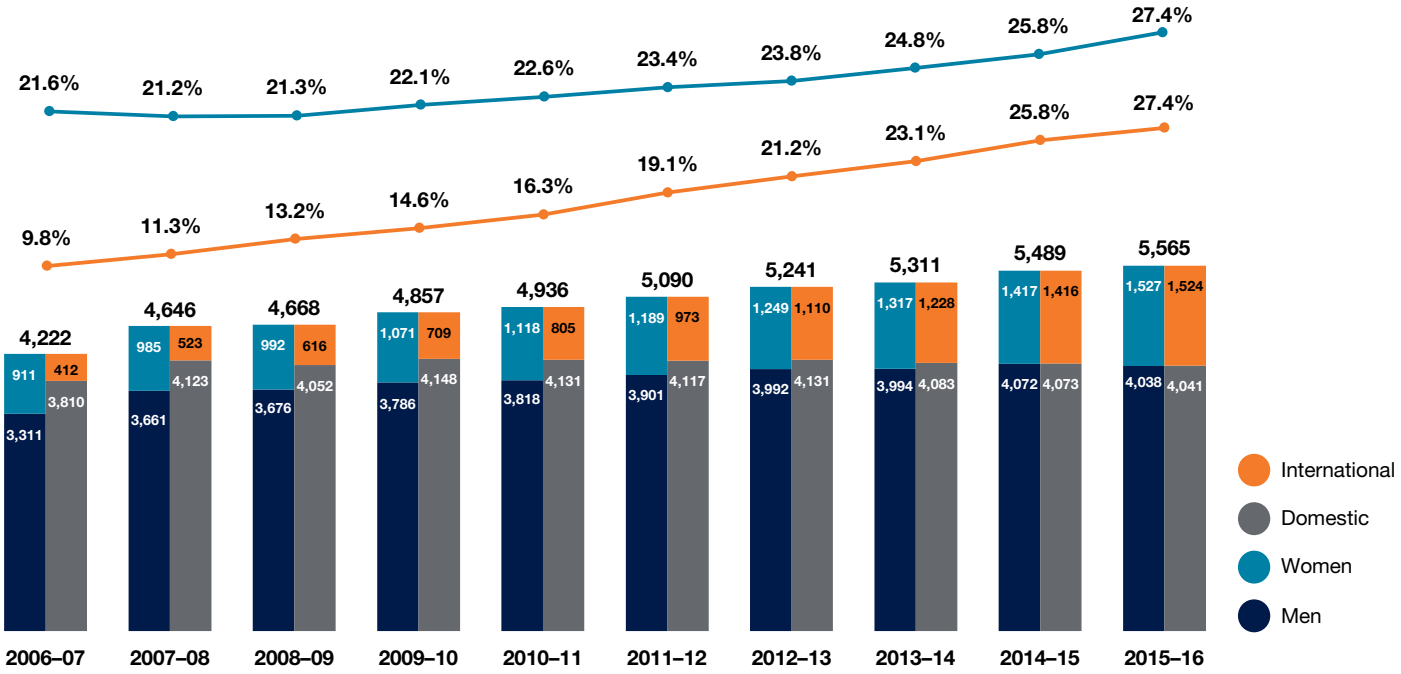
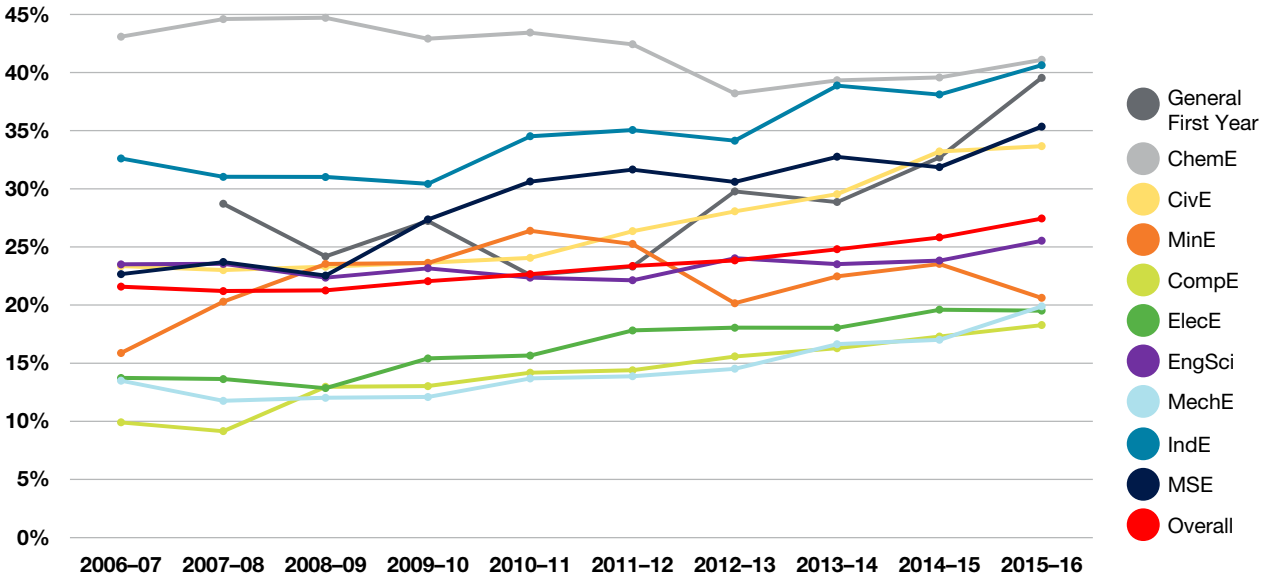
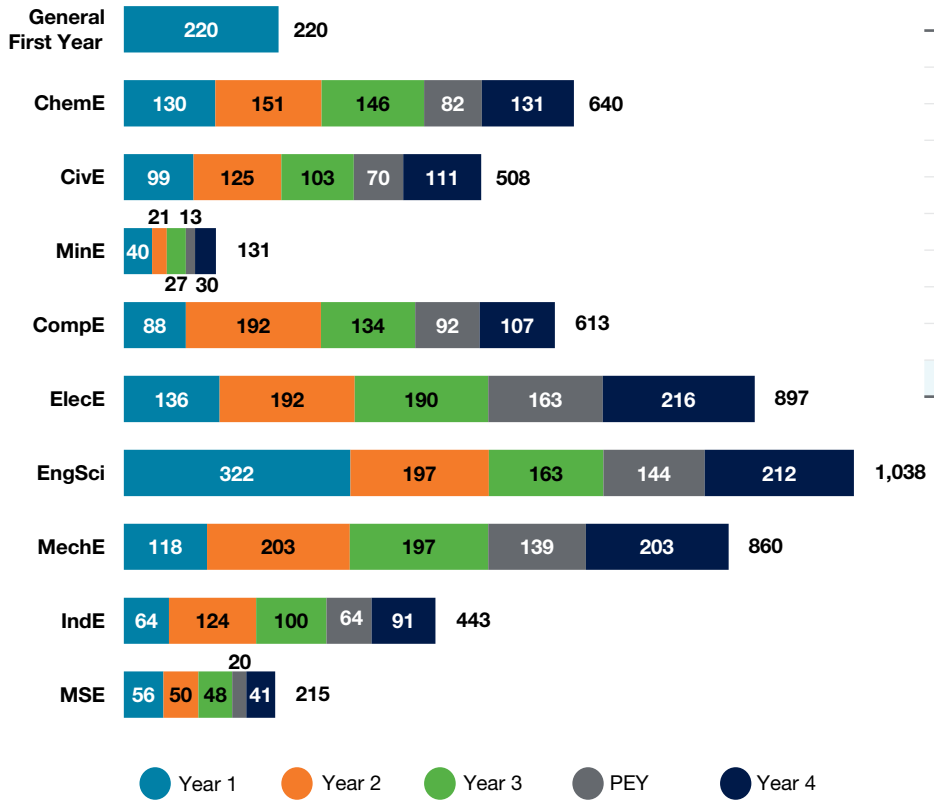


Figure 1.5b **Women as a Proportion of Total Enrolment by Program, 2006–2007 to 2015–2016**



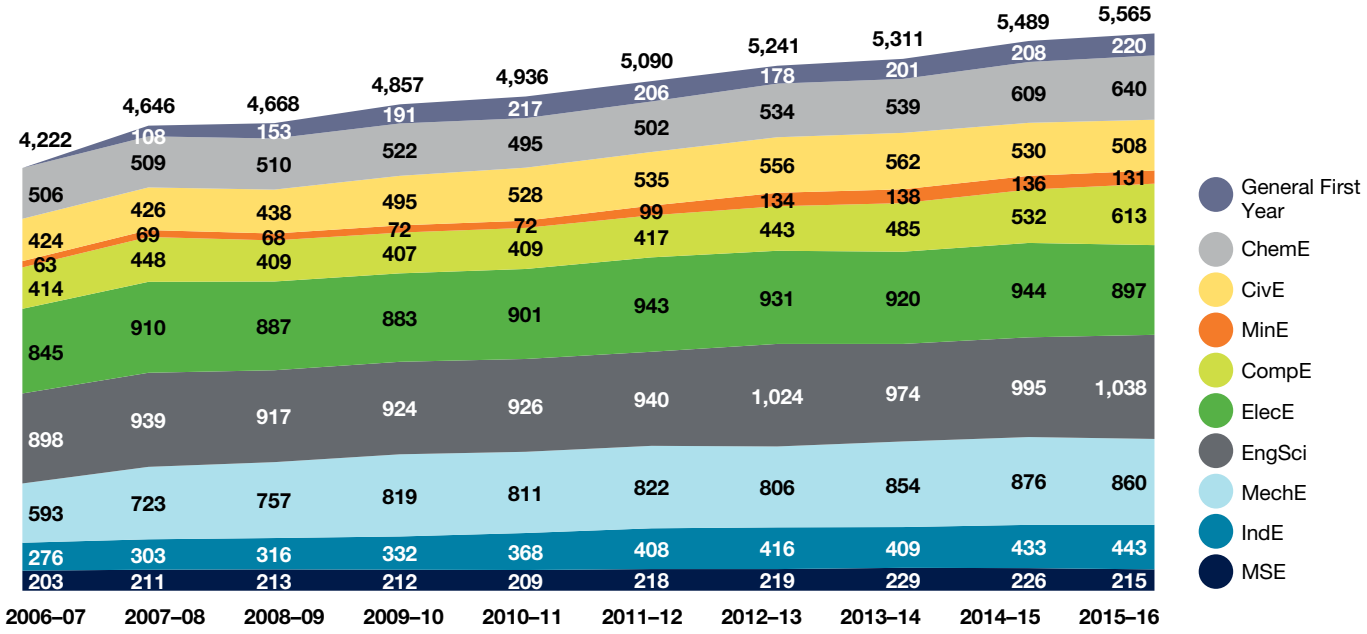
Note 1.5: Includes full- and part-time students and those on Professional Experience Year (PEY) internships. Does not count students with special (non-degree) status. Student counts shown as of November 1. Domestic students are defined as citizens or permanent residents of Canada. For more information about our international enrolment goal, please see Academic Plan, Chapter 4, Goal 12

Figure 1.6 Undergraduates by Program, Year of Study and Professional Experience Year (PEY), 2015–2016



Engineering Science Majors	Enrolment
Aerospace Engineering	51
Biomedical Systems Engineering	58
Electrical and Computer Engineering	99
Energy Systems Engineering	36
Infrastructure Engineering	29
Mathematics, Statistics and Finance	53
Nanoengineering	4
Engineering Physics	13
Robotics Engineering	32
Total	**375**

Figure 1.7 Undergraduates by Program, 2006–2007 to 2015–2016



Note 1.6: Student counts are shown as of November 1, 2015. Engineering Science Majors show only students in Year 3 and Year 4 and do not count students on PEY internships.
Note 1.7: Student counts are shown as of November 1.

Need-Based Funding

We remain committed to ensuring that students are able to enrol in our degree programs and complete their course of study regardless of financial means. We provide funding for undergraduate students through a variety of sources, including from individual donors and from the University of Toronto Advanced Planning for Students (UTAPS) program.

The number of undergraduate students receiving need-based awards in 2015–2016 was 1,627. The total amount of student support increased to its highest-ever value of $12 million. This funding is distributed relatively evenly across all four years of study.

The amounts shown in this chapter do not include merit-based scholarships or awards, or funding from provincial assistance programs such as the Ontario Student Assistance Program (OSAP).

Figure 1.8a Number of Awards Received by Cohort with Total Number of Undergraduate Need-Based Award Recipients, 2009–2010 to 2015–2016

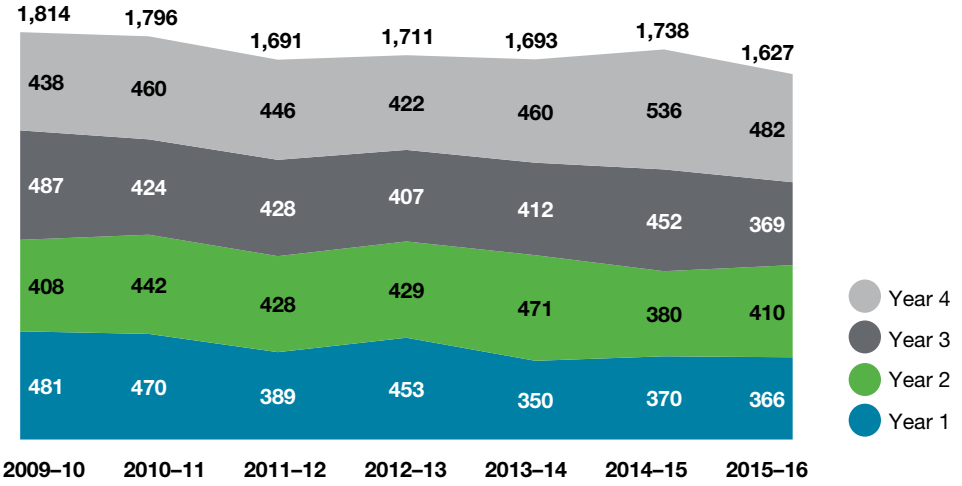
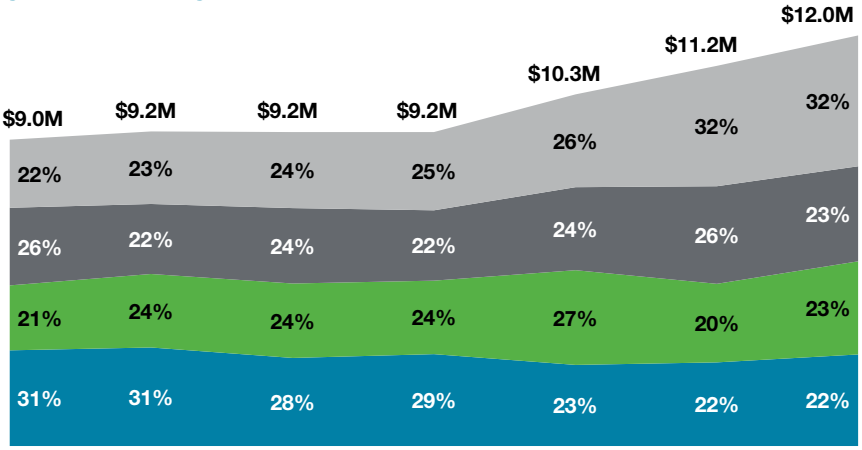


Figure 1.8b Total Value of Undergraduate Financial Assistance and Percentage Distributed by Year of Study, 2009–2010 to 2015–2016



	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Year 4	$1,995,808	$2,130,098	$2,229,278	$2,296,173	$2,725,785	$3,532,950	$3,838,001
Year 3	$2,280,152	$2,049,237	$2,205,736	$2,061,174	$2,429,321	$2,866,515	$2,796,358
Year 2	$1,897,712	$2,157,800	$2,185,640	$2,160,969	$2,781,695	$2,299,026	$2,726,303
Year 1	$2,806,624	$2,886,898	$2,580,676	$2,686,997	$2,372,994	$2,451,770	$2,683,073
Total	$8,980,296	$9,224,033	$9,201,330	$9,205,313	$10,309,795	$11,150,261	$12,043,735

Note 1.8a and 1.8b: Data for these figures were obtained from the new Student Accounts Reporting Cube. In previous Annual Reports, data was obtained from Faculty Registrar's Office. For more information, see Data Sources.

Degrees Awarded

Students at U of T Engineering earn either a Bachelor of Applied Science (BASc) or Bachelor of Applied Science in Engineering Science (BASc EngSci). Both degrees can be completed in four years. However, many of our second- and third-year students choose to augment their degrees by participating in our Professional Experience Year (PEY) internship program, which adds 12 to 16 months to their time-to-completion. *(For more information on PEY, please refer to Chapter 4: Cross-Faculty Education and Experiential Learning.)*

Figure 1.9a **Undergraduate Degrees Awarded by Program, 2006–2007 to 2015–2016**

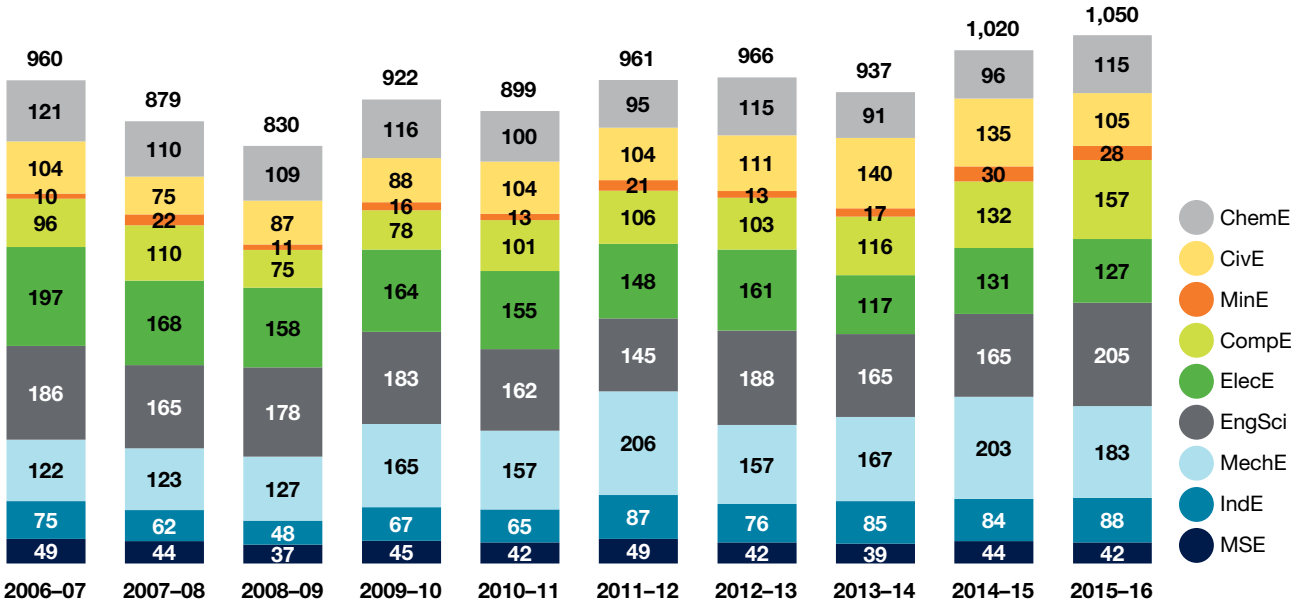
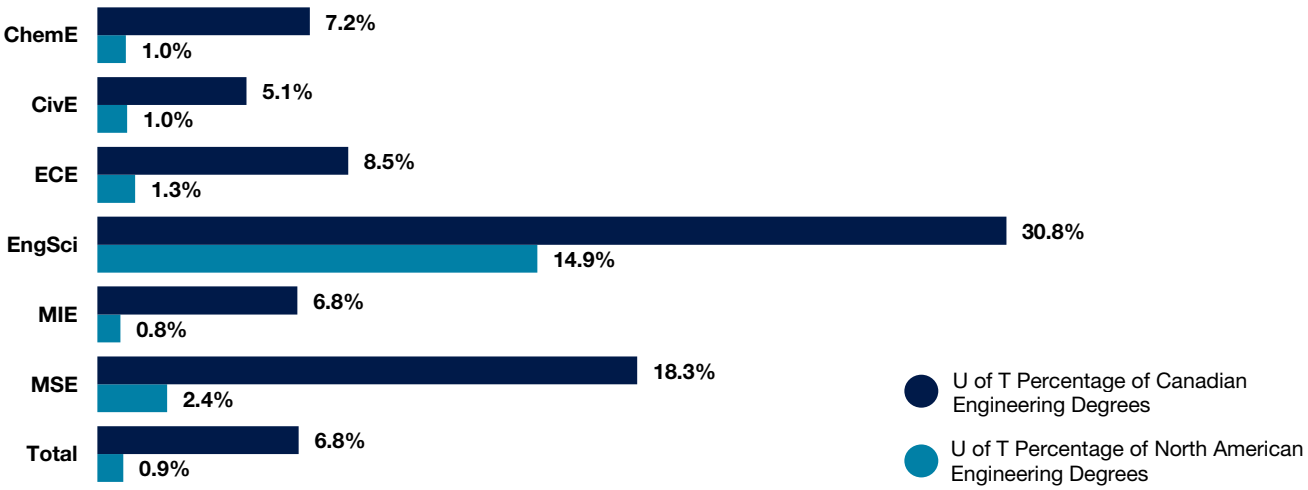


Figure 1.9b **U of T Engineering Degrees Awarded by Academic Area Compared with Canadian and North American Degree Totals, 2014**



Note 1.9a: Data reported by academic year (September to August).
Note 1.9b: Data sourced from reports produced by Engineers Canada and the American Society for Engineering Education. Total percentages represent all engineering degrees in North America, including those in fields that are not specifically identified at U of T.

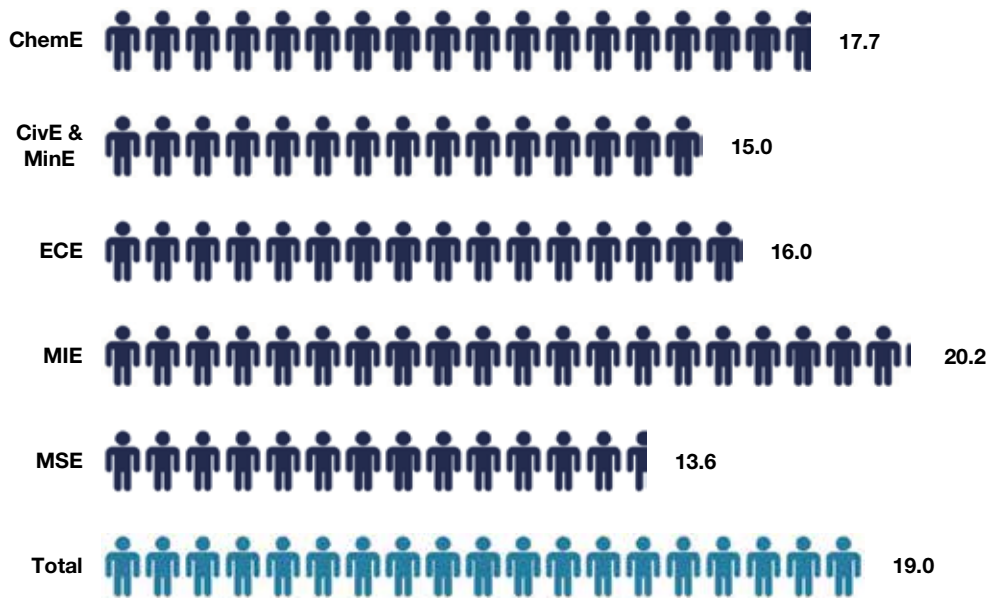
Student-to-Faculty Ratios and Dean's Honour List

Figure 1.10 shows the number of undergraduates in each department relative to the number of teaching faculty in that department. Students in programs such as Engineering Science and General First Year that employ a cross-faculty teaching approach, students are included only in the "Total" bar.

In 2016, 39 per cent of graduating students achieved Honours or High Honours (Figure 1.11a). To graduate with Honours, a full-time student must achieve a cumulative average of higher than 79.5 per cent across second, third and fourth years and a weighted sessional fourth-year average of 74.5 per cent or higher. The designation of High Honours, created in June 2015, distinguishes students who obtain a cumulative average of 87.5 per cent or higher and a weighted sessional fourth-year average of 82.5 per cent or higher. Both designations provide a measure of the outstanding achievement of our students.

The number of students who attained Dean's Honour List standing in 2015–2016 also remained strong, reflecting the high calibre of our students and the many programs we offer to support students throughout all years of study.

Figure 1.10 **Undergraduate Students per Faculty Member by Academic Area, 2015–2016**



Note 1.10: Student and faculty counts are shown as of November 1, 2015. For full-time equivalency (FTE), each part-time student is counted as 0.3 FTE. Students with special (non-degree) status or on PEY internships are not included. Faculty counts include tenure-stream and teaching-stream faculty.

Figure 1.11a **Number of Students and Percentage of Class Graduating with Honours, 2007 to 2016**

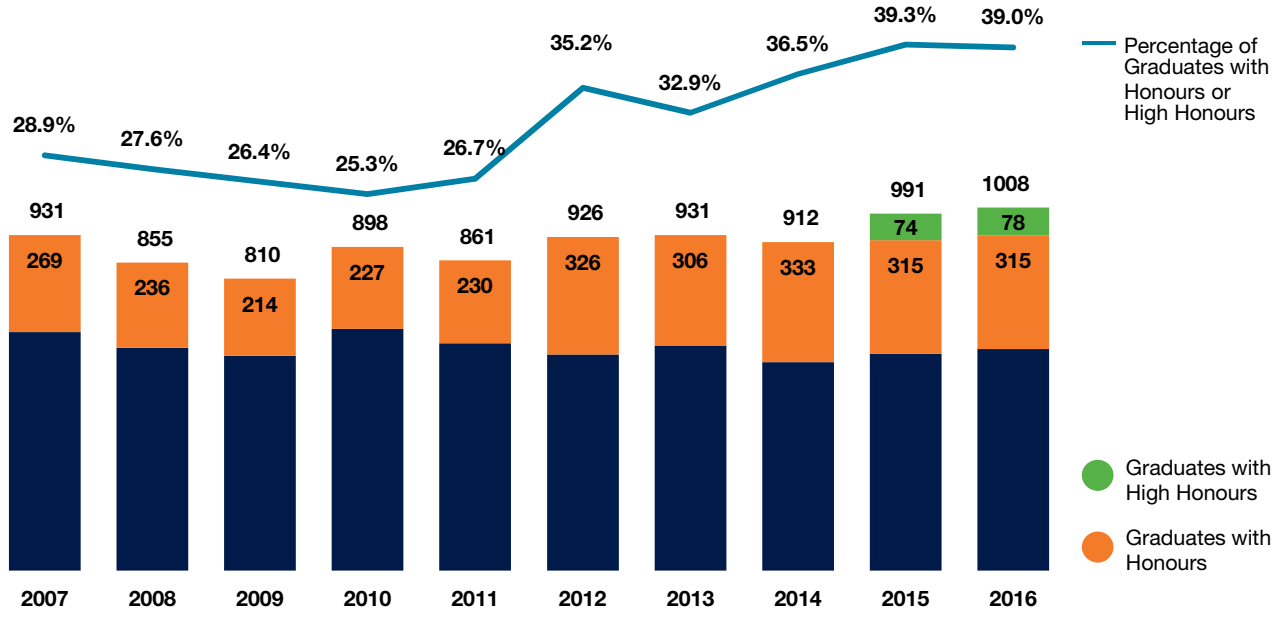
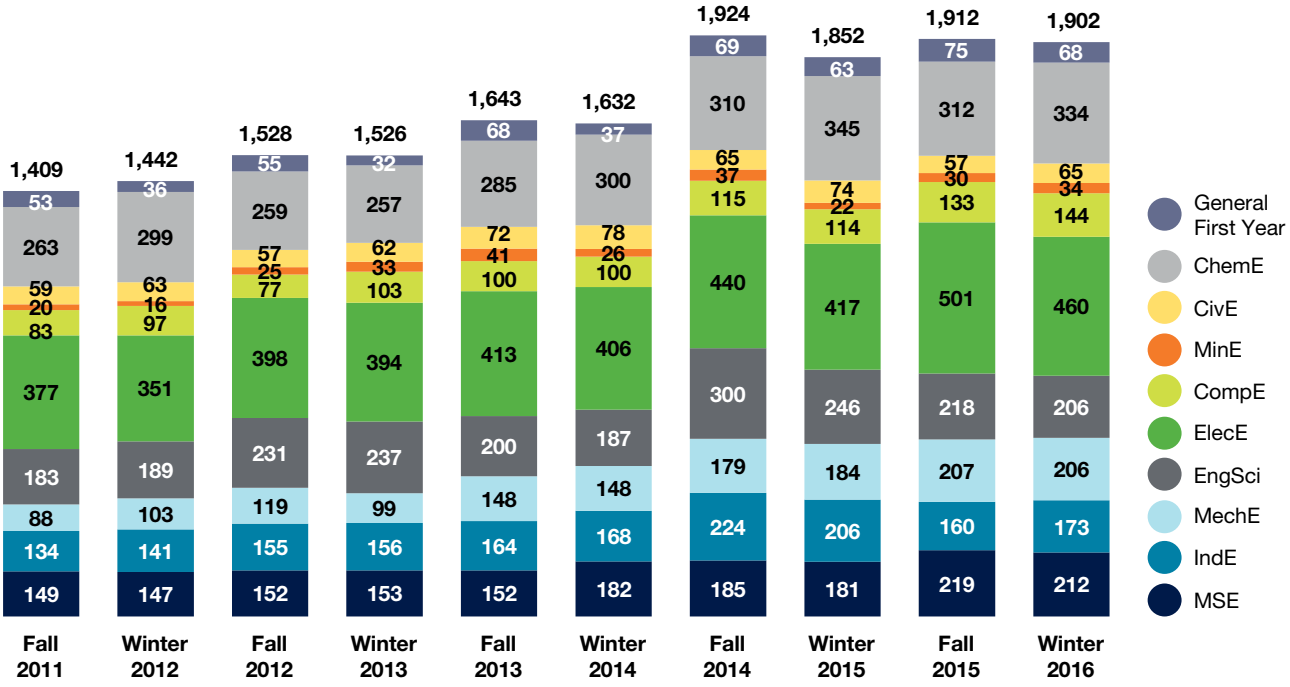


Figure 1.11b **Number of Students on the Dean's Honour List by Term and Academic Area, Fall 2010 to Winter 2016**



Note 1.11b: Honours standing is normally granted to students carrying a full academic load (2.5 credits per session, excluding extra courses) if the session is not being repeated. During fourth year, a student may reduce their course load in either semester (but not both) and still be eligible for Honours standing, provided the other conditions are met.

Enriching the Undergraduate Engineering Experience

At U of T Engineering, we offer our undergraduates an exceptional learning environment and an unparalleled student experience. Experiential learning, multidisciplinary collaboration, entrepreneurship and diverse opportunities to develop key technical and professional competencies are the pillars of our rich academic and co-curricular programs. *(See Appendix A for a complete list of student clubs and teams)*

We continually review and strengthen our programs to ensure our students graduate with the competencies they need to address the world's greatest challenges. In 2015–2016, we took significant steps to begin implementing the recommendations of the Core Curriculum Review Task Force to enhance the content and delivery of the first-year curriculum. In fall 2015, we introduced APS 100H1F Orientation to Engineering, a required course that is designed to help entering students in our Core 8 and General First Year programs transition to first-year engineering studies. Through six one-hour lectures, supplemented by 12 one-hour tutorials led by upper-year teaching assistants, the course covers key topics such as good study habits, time management and engineering ethics. Many of the lectures featured guest speakers, including current undergraduate and graduate students and alumni. Two staff members from our First Year Office delivered a presentation about this new course at the Annual Conference on The First-Year Experience in February 2016.

We also moved forward with the following recommendations from the task force:

- We implemented a numerical computation component in MAT 188 Linear Algebra by adding six two-hour labs that gave students an opportunity to learn MATLAB.
- We created a First Year Core 8 Curriculum Committee to help implement the task force's recommendations.
- We completed a curriculum-mapping exercise of our first-year program and began a search for a teaching-stream faculty position within the Faculty and the First Year Office that will be responsible for enhancing first-year course integration.
- Beginning in 2016–2017, we will introduce:
  - a new Engineering Chemistry and Materials Science course for General First Year and ECE students; and
  - a change in the programming language in one of our first-year programming courses that will provide a better introductory learning experience for students who will not take advanced programming courses.

We continued to pilot a Technology Enhanced Active Learning (TEAL) room in the Sandford Fleming Building to inform and optimize the design of planned TEAL rooms in the CEIE. We also expanded the number of online courses we offer to four: APS 160 Mechanics; APS 162 and 163 Calculus for Engineers; and APS 164H1 Introductory Chemistry from a Materials Perspective. We continued to provide lecture capture for most first-year classes to enable students to review lecture material outside class.

Our commitment to student success starts before entering students begin their classes. As part of our First Year Foundations programs, we offer Success 101, a three-day academic skills mini-course, several times each summer to help new students prepare for their studies at U of T Engineering. It offers guidance on time management, effective note taking, classroom etiquette, different learning styles and effective classroom communication, as well as tips for students who are living in residence or commuting. First-year students can also take weeklong summer programs in engineering design and computer programming to enhance their competencies in these areas before they begin their studies.

In 2015, we offered a calculus "boot camp," which gave entering students an opportunity to review key mathematical concepts and see how they are applied to university-level calculus. We continued to give entering students the opportunity to take APS 162 Calculus for Engineers as an online, for-credit course over the summer. We also offered a summer orientation program to help international students meet their classmates and get to know the campus and the city.

During their first year, students have access to diverse programs to support their learning. Embedded counsellors help identify students who may benefit from extra academic support, and we also offer Peer-Assisted Study Sessions run by highly successful upper-year students. The Transition Program allows first-year students who experience academic challenges to redistribute their course load, defer some courses to the summer session and repeat up to three fall courses in the winter term, enabling them to proceed to second year on schedule. We also held the third annual First Year Instructors Day in September 2015 to help ensure consistency in student experience and raise awareness among our instructors of supports that are available to first-year students.

Engineering students in all years can meet with a learning strategist at the University of Toronto Academic Success Centre to discover how they learn best and develop more effective study strategies. The Engineering Communication Program, which celebrated its 20th anniversary this year with a speaker series, helps undergraduates hone their communication skills and

provides assistance in preparing written assignments and presentations. We struck task forces on mental health and on academic and student advising to improve the experience of all our students in these important areas, and expect to have their recommendations in fall 2016.

Our Faculty is committed to supporting the next generation of makers and innovators through rich experiential learning opportunities. Starting in first year, all of our undergraduate students work in teams on open-ended design challenges through either Engineering Strategies & Practice or Praxis courses. In upper years, students build on these experiences through either departmental capstone courses, programs offered by the University of Toronto Institute for Multidisciplinary Design and Innovation (UT-IMDI) — including APS 490 Multidisciplinary Capstone Project (MCP) and industry-sponsored projects — or PEY internships with leading companies around the world.

For further information about experiential learning and multidisciplinary collaboration, please see Chapter 4: Cross-Faculty Education and Experiential Learning.

Selected Undergraduate Highlights

Better Mop Design Wins Safety Award for U of T Engineering Students

In April 2016, third-year Engineering Science students Jeremy Wang, Shuyi Wu, Ryan Williams and Noah Yang (all EngSci 1T7 + PEY) won second prize in the 2016 Minerva Canada James Ham Safe Design Awards competition. They designed PowerWring, a small, simple device that attaches to the short handle of any mop wringer and multiplies the force of wringing by allowing the worker to leverage the much longer mop handle. The worker can stay upright while wringing the mop, and the force required of them is reduced by half or more. The product was developed as part of Praxis Engineering Design. As a result of support from The Entrepreneurship Hatchery, PowerWring has patents under review in Canada and the U.S.

Strong Finish for U of T Supermileage Team at Shell Eco-Marathon

The University of Toronto Supermileage Team delivered a strong second-place finish at the 2016 Shell Eco-Marathon Americas, held April 22-24 in Detroit, Michigan. Their vehicle, christened UT4, achieved a fuel efficiency of 1,005 kilometres per litre of gasoline, or 2,364 miles per gallon. It was bested only by the Alérion Supermileage team from Université Laval, which achieved 1,099 kilometres per litre (2,584 miles per gallon). The competition, held annually since 2007, featured 125 teams from the United States, Guatemala, Mexico, Canada, Brazil, Ecuador and Puerto Rico.

Bronze Medal Finish for Blue Sky Solar Racing at American Solar Challenge

In August 2016, U of T Engineering's Blue Sky Solar Racing team finished third at the American Solar Challenge. Horizon — Blue Sky's eighth-generation vehicle — zipped across the finish line with a final time of 62 hours, 11 minutes and three seconds. The eight-day rally-style solar car race covers 1,975 miles (3,178 kilometres) through the eight American states. In October 2015, Horizon competed in the biennial World Solar Challenge in Australia, where it placed 12th in a field of 27 vehicles.

U of T Engineering Students Honoured with OPE Scholarships

In March 2016, the Ontario Professional Engineers Foundation for Education presented an admission scholarship and eight in-course scholarships totaling $15,000 to students from U of T Engineering. The recipients were honoured for their participation in co-curricular activities while maintaining above average grades. They included: Chia Hang (Kevin) Chang (Year 3 ElecE), Lia Orders Codrington (Year 1 EngSci), Kun Yi Antonio Juan Ding (Year 3 ChemE), Haya Elaraby (Year 3 IndE), Savannah Forest (Year 4 CivE), Ran Hong (Year 3 MSE), Katherine Lonergan (Year 3 MechE), Connor Jackson Smith (Year 4 CompE + PEY), Paul Minkang Suk (Year 2 EngSci).

International Scholar Awards Draw Top Students

Tamara Abugharbieh (Year 1 EngSci) of Jordan and Katherine Bancroft (Year 1 General First Year) of Singapore were the first recipients of the International Scholar Awards, a new scholarship that enhances U of T Engineering's ability to attract top students from around the world. The award, which covers full tuition and is renewable for up to four years, recognizes students studying abroad who have exceptional marks, are involved in extra-curricular activities and want to use their engineering degrees to improve the world.

UnERD showcases innovations from undergraduate summer research

Projects on tissue engineering, cancer detection and algal biofuels took top prizes in August 2016 at the Undergraduate Engineering Research Day (UnERD). The annual event featured nearly 100 poster and podium presentations on a wide range of topics, from sustainable energy to biomedical engineering. This year's top presenters were Jasmine Quigley (Year 4 EngSci), Chris Zhang (Medical Biophysics) and Onasvi Kharsikar (Year 3 ChemE). Quigley and Zhang won an opportunity to publish their research in *STEM Fellowship Journal*, a peer-reviewed publication that aims to be a "showcase for original, interdisciplinary ideas and supports the inquiry-based approach of the Internet-educated generation."

Lassonde Mineral Engineering Team Wins World Mining Competition

A student team from the Lassonde Mineral Engineering Program won the fourth annual World Mining Competition, held from October 29 to November 1, 2015 at the University of Saskatchewan. Seung Young Baek (Year 4 MinE), Matthew Hart (Year 3 MinE), Daryl Li (Year 4 MinE) and Peter Miszkiel (Year 4 MinE) placed first among 13 teams and 11 schools from Canada, Germany, India and the United Kingdom. The multidisciplinary competition challenges teams — generally composed of business, engineering and geology students — to solve a mining strategy case based on issues facing the international mining industry.

In 2015, the case focused on sustainability and required teams to act as consultants for a fictitious mining company seeking to acquire a junior exploration company that owns a lithium mine. The teams had 36 hours to create proposals that considered social, environmental, economic and political factors, which they presented to a panel of judges composed of accounting, human resources and government representatives, as well as mining executives.

Undergraduate Engineering Student Wins Aircraft Design Competition

In October 2015, Arthur Brown (Year 4 EngSci) took the top prize in the American Institute of Aeronautics and Astronautics Foundation's Undergraduate Individual Aircraft Design Competition. Brown's project, which took several months to complete, involved designing an unpiloted aircraft that could fly supersonically for 1,000 nautical miles or more, drop a payload of 4,000 pounds and then return to base. Brown is the first student from a Canadian university to win the international design challenge.

Canadian Engineering Memorial Foundation honours CivE student for mentorship of young women

In May 2016, Sara Maltese (Year 3 CivE) was awarded the Marie Carter Memorial Undergraduate Engineering Scholarship from the Canadian Engineering Memorial Foundation (CEMF). The award honours her work as an Ambassador for the WISE High School Outreach team, delivering engaging presentations about science and engineering to schools across the Greater Toronto Area. In 2014, Maltese helped organize a new outreach event called Take Your Kid to Skule™ day, inviting high school students to spend a day at U of T Engineering to learn more about the engineering profession and the programs offered by the Faculty. The Canadian Engineering Memorial Foundation is dedicated to attracting women to the engineering profession so they may fully contribute to the development of our society and in so doing, honour the memory of the 14 women from L'École Polytechnique who were killed in the shooting on December 6, 1989.

U of T Engineering Gains Two Schulich Scholars

Two first-year engineering students were among four entering U of T students who were honoured with prestigious Schulich Leader Scholarships in 2015. Christopher Choquette-Choo (Year 1 EngSci) and Daniel McInnis (Year 1 MechE) each received $80,000 through the program, which was started in 2012 by business leader and philanthropist Seymour Schulich. The program awards 50 scholarships annually to top students across Canada who are pursuing undergraduate degrees in science, technology, engineering and math (STEM) and have demonstrated significant leadership qualities.

University of Toronto Aerospace Team Unveils its Latest Fleet

The University of Toronto Aerospace Team (UTAT) displayed its latest innovations to more than 200 people at the 2016 Aerospace Showcase, held in March 2016. The team's projects included a hybrid drone with both wings and rotors, a supersonic rocket powered by laughing gas and candle wax and a satellite smaller than a toaster that could carry microorganisms into orbit. UTAT has more that 100 members from the Faculties of Applied Science & Engineering, Arts & Science and Medicine, and is active in five areas: rocketry, aerial robotics, unpiloted aerial vehicles, space systems, and outreach and advancement.

Pre-University Engineering Outreach

Through the Engineering Student Outreach Office, we design and deliver a range of pre-university programs that engage students in Grades 3 to 12 in science, technology, engineering and math (STEM). The graduate and undergraduate students who deliver these programs serve as ambassadors for the Faculty while gaining invaluable experience in youth education and project management. We also bring together elementary and secondary school teachers to share innovative ways of bringing STEM to the classroom.

Every summer, our Da Vinci Engineering Enrichment Program (DEEP) Summer Academy draws extremely motivated high school students from around the world to week-long courses, where they explore a variety of engineering, business and science disciplines. We also offer March break and summer camps, Saturday programs and in-school workshops that inspire elementary school students to explore topics ranging from aerospace engineering to coding to regenerative medicine. We are particularly proud that our programs successfully connect girls and youth from underrepresented communities — including Indigenous youth —with STEM.

In 2015–2016, we reached more than 9,000 pre-university students through our outreach programs. *See Appendix B for a full list of these programs.*

Highlights of our outreach programs include:

- Innovate U, Canada's largest science, technology, engineering and math (STEM) event for children in Grades 3 to 8. This one-day workshop, held on May 13, 2016, was run in partnership with Google Canada and Actua, a national STEM charity. It attracted more than 1,400 students and teachers from across the GTA.
- Engineering for Educators, a day-long event held in November 2015 that brought together more than 40 science and math teachers from across the GTA for a series of interactive and collaborative workshops on teaching and learning STEM.
- Four full-day workshops in February 2016 that drew nearly 350 elementary-school teachers from the Toronto District School Board to learn how computer coding can help them teach everything from mathematics to literacy. Taught by U of T Engineering students, the workshops provided teachers with an introduction to Scratch, a visual coding tool created by the Lifelong Kindergarten Group at the Massachusetts Institute of Technology (MIT) Media Lab. Through a simple drag-and-drop interface, users can create animations, games and even program simple robots to perform tasks. Funding for the workshops came from Codemakers, a national program delivered by Actua, in partnership with Google.
- Visits to three California science fairs in March 2016 to engage with top Grade 10 and 11 students and offer scholarships to DEEP Summer Academy. These scholarships allow us to attract top students to DEEP and raise the profile of U of T Engineering in a key region.

In addition to activities organized by the Engineering Outreach Office, many of our students also lead activities for national STEM outreach organizations:

- In May 2016, graduate student Yonatan Lipsitz (IBBME PhD candidate) and a team of volunteers from across U of T partnered with Sandy Lake First Nation in Northern Ontario to deliver a series of workshops aimed at reducing the high rates of Type II diabetes in the community through Let's Talk Science, a national STEM charity.
- In July and August 2016, undergraduate student Rachel Mandel (Year 3 MIE) was one of 12 students from across Canada who were selected to deliver workshops through the National Indigenous Youth in STEM (InSTEM) program from Actua.

For more on these initiatives, see Chapter 10: Diversity.

2

Our extraordinary professors, outstanding research- and professional-stream graduate programs, and exceptional global reputation attracted a record number of graduate students in 2015–2016. Driven by strong demand for our Master of Engineering (MEng) program, particularly among international students, this rapid growth builds on our success in surpassing our Academic Plan goal of enrolling 2,000 graduate students by 2015, which we accomplished two years ahead of schedule. Our graduate students are uniquely positioned to take up leadership positions in both academia and industry, where they will drive innovation, apply engineering to new problems and address critical global challenges.

We strengthened our MEng offerings in fall 2015 by launching new emphases in Sustainable Energy and Advanced Manufacturing, and approved the creation of a new MEng in Biomedical Engineering, a one-year program focusing on medical device design that is welcoming its first cohort in fall 2016. Growth in our professional master's programs was particularly robust in 2015–2016, with applications from international students increasing by one-quarter compared with the previous year. Enrolment in the MEng and Master of Health Science (MHSc) programs now makes up more than half of full-time equivalent master's students, exceeding our Academic Plan goal of 50 per cent by 2015–2016.

Enrolment in our research-stream graduate programs held steady in 2015–2016 as we focused on attracting the very best domestic PhD candidates and encouraged MASc students to fast-track into the doctoral program. We actively recruited top students from across Canada through events such as Graduate Research Days and a nationwide recruitment tour held in partnership with a consortium of the country's best engineering schools. We continued to prepare PhD students for academic positions through the Prospective Professors in Training program, and are creating similar resources for developing competencies relevant to roles in industry and other non-academic settings.

Our PhD program continues to draw large numbers of applications from top international candidates. However, we have been able to accept a limited number of these applicants because the Ontario government did not provide funding to universities for international PhD students until recently. We are encouraged that the province opened the door in 2015 to providing grants to universities for a small number of international PhD students. We are optimistic this development will enable us to accept more extraordinary students from abroad and increase the already exceptional quality of our PhD cohort.

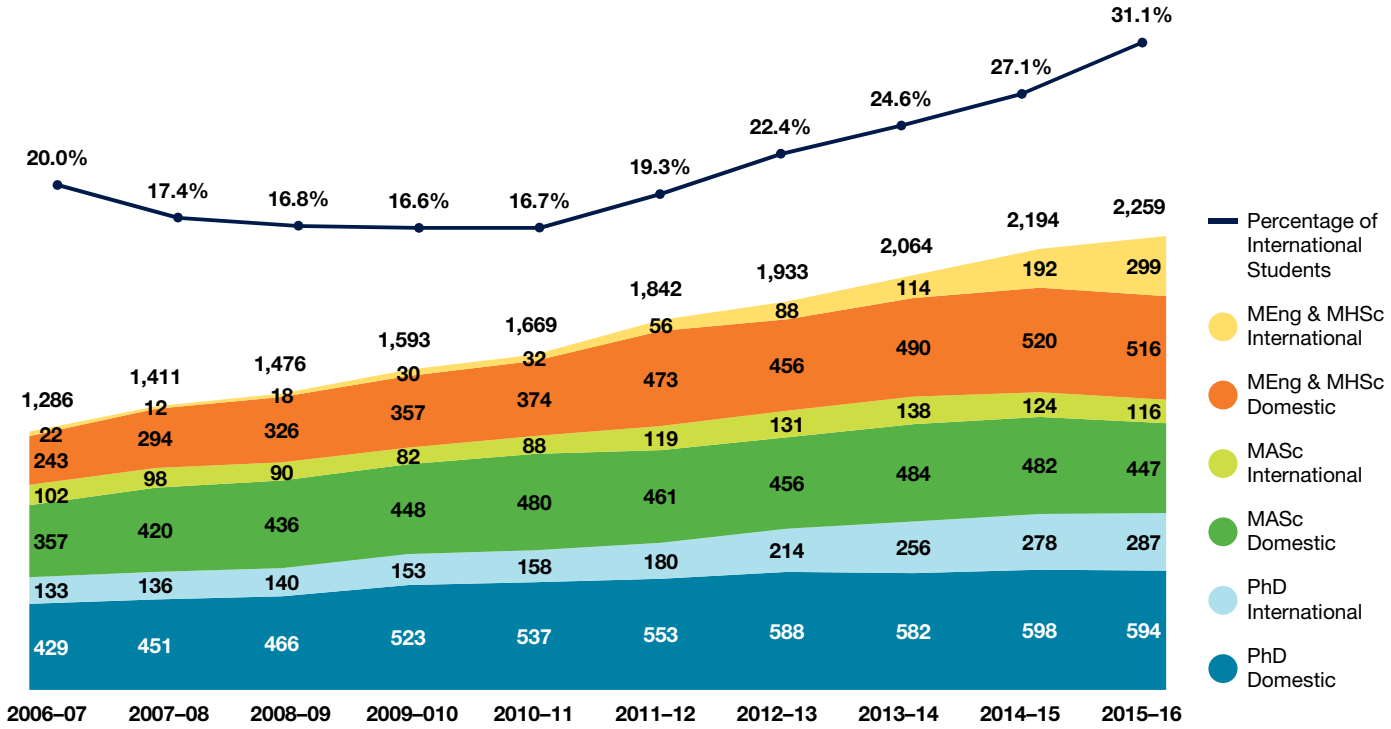
Enrolment

Our graduate enrolment increased in both size and diversity in 2015–2016 as our programs attracted top students from across Canada and around the world. A total of 2,259 students pursued graduate degrees at U of T Engineering, up three per cent from the previous year and 76 per cent from a decade ago, with enrolment growing across nearly every academic area. Over the past 10 years, we have increased the proportion of graduate students in our overall student body from 22.1 per cent to 31.5 per cent, bringing us closer to our Academic Plan goal of 40 per cent. This growth strengthens our position as a leader in research-based and professional graduate education while maintaining our standard of excellence in undergraduate engineering education.

The proportion of international graduate students jumped to 31.1 per cent from 27.1 per cent in 2014–2015, while the percentage of women increased slightly year over year to 27.1 per cent. We expect growth in female graduate enrolment to accelerate over the next five years as the number of women studying engineering at the undergraduate level continues to grow. For the past two years, women have comprised nearly one-third of our entering undergraduate classes, expanding the future pool of potential female applicants for graduate studies.

The total number of students pursuing professional master's degrees (MEng and MHSc) increased to 815 in 2015–2016, up 14 per cent from the previous year and more than triple the enrolment in these programs a decade ago. International students accounted for much of this year's growth, comprising 37 per cent of professional master's students, up from 27 per cent in 2014–2015 and only eight per cent in 2010–2011. As a result of this strong increase, the number of full-time equivalent professional master's students has now surpassed the number of full-time equivalent MASc students, achieving the goal we set in our Academic Plan. We continue to enhance and broaden our MEng offerings, which enable practising engineers to gain specialized technical knowledge and develop leadership and other professional competencies that will advance their careers.

Figure 2.1a **International and Domestic Graduate Students by Degree Type, with Percentage of International Students, 2006–2007 to 2015–2016**



Data in this chapter are presented by academic year (September to August) unless otherwise noted. Highlights are from May 2015 to August 2016.

Note 2.1a: Student counts are shown as of November 1.

Figure 2.1b **Graduate Students by Degree Type and Gender with Percentage of Women Students, 2006–2007 to 2015–2016**

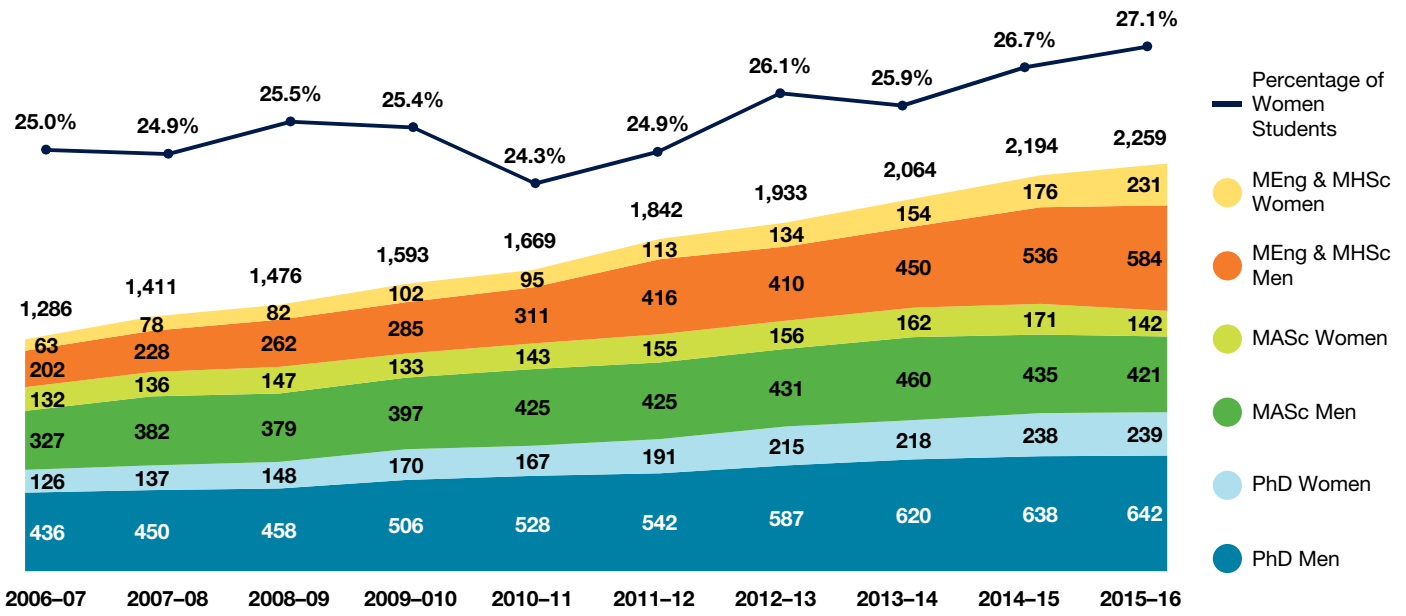


Figure 2.1c **Graduate Student Enrolment by Full-Time Equivalent (FTE) and Headcount (HC) by Academic Area, 2006–2007 to 2015–2016**

		UTIAS	IBBME	ChemE	CivE	ECE	MIE	MSE	Total
2006–2007	FTE	79.6	75.0	138.5	160.3	407.3	238.8	67.5	**1,167.0**
	HC	81	75	142	182	457	278	71	**1,286**
2007–2008	FTE	105.0	115.0	150.0	183.3	438.1	227.3	71.2	**1,289.9**
	HC	105	115	157	212	478	270	74	**1,411**
2008–2009	FTE	122.9	140.0	167.8	184.0	415.4	237.1	82.8	**1,350.0**
	HC	125	140	179	219	442	284	87	**1,476**
2009–2010	FTE	130.6	153.0	209.1	200.2	421.5	284.3	70.4	**1,469.1**
	HC	132	153	221	238	453	320	76	**1,593**
2010–2011	FTE	140.9	168.0	195.4	212.6	403.0	339.2	68.5	**1,527.6**
	HC	143	168	208	256	431	391	72	**1,669**
2011–2012	FTE	143.2	199.0	202.3	229.8	437.7	382.6	68.2	**1,662.8**
	HC	146	199	217	276	479	454	71	**1,842**
2012–2013	FTE	146.7	208.3	193.2	243.3	504.8	387.2	68.2	**1,751.7**
	HC	153	209	203	279	565	453	71	**1,933**
2013–2014	FTE	162.1	219.0	209.9	290.5	509.8	436.2	90.9	**1,918.4**
	HC	167	219	219	322	556	488	93	**2,064**
2014–2015	FTE	182.4	228.0	238.0	293.1	531.5	511.2	80.3	**2,064.5**
	HC	188	228	245	312	577	563	81	**2,194**
2015–2016	FTE	143.2	241.0	253.0	299.4	591.5	532.9	79.0	**2,140.0**
	HC	146	241	260	326	637	570	79	**2,259**

Note 2.1b: Student counts are shown as of November 1.
Note 2.1c: A difference between FTE and HC exists only when discussing part-time students. At U of T Engineering, MEng candidates are the only graduate students who can pursue their studies on a part-time basis.

Enrolment in our research-stream graduate programs remained stable in 2015–2016 as we continued to focus on the quality of our students. The number of PhD students increased slightly year-over-year, with enrolment growing by 27 per cent compared with five years ago, largely due to an increase in the number of international students, among whom demand for our programs is extremely high. MASc enrolment has been flat over the same period, reflecting our practice of encouraging these students to fast-track into doctoral studies to enhance the impact of their work, and the increasing attractiveness of the MEng.

The number of graduate students per faculty member increased in our professional stream, reflecting strong enrolment growth, and decreased slightly in our research-stream programs.

Figure 2.1d **Comparison of MASc and MEng/MHSc Full-Time Equivalent Enrolment Trends 2006–2007 to 2015–2016**

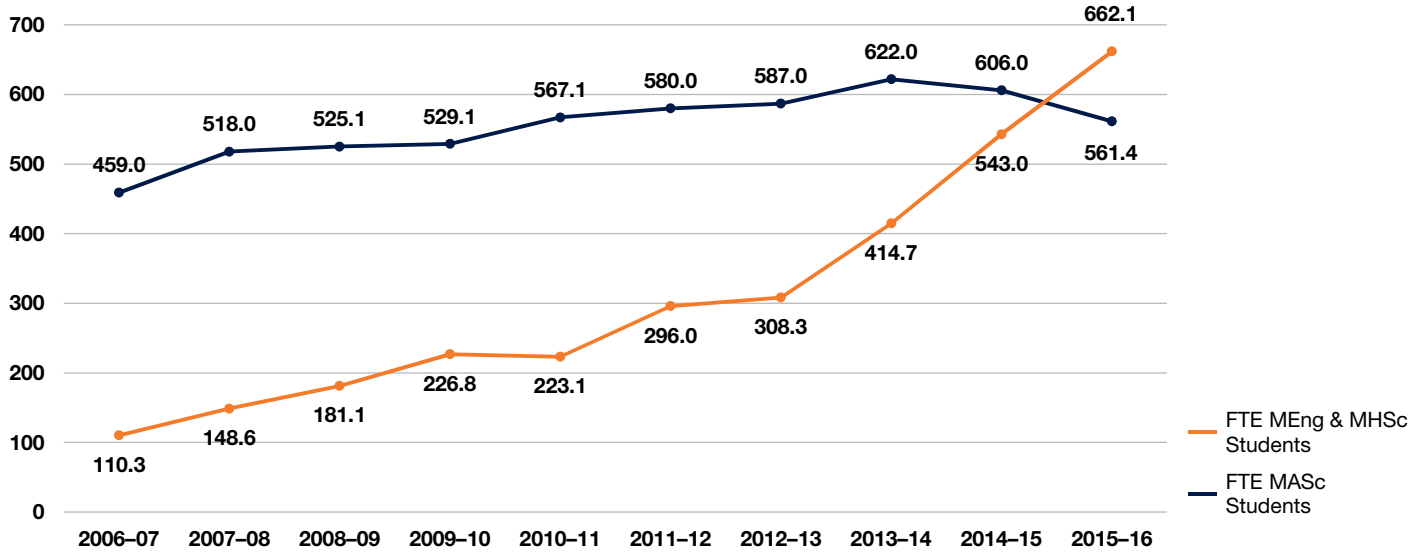
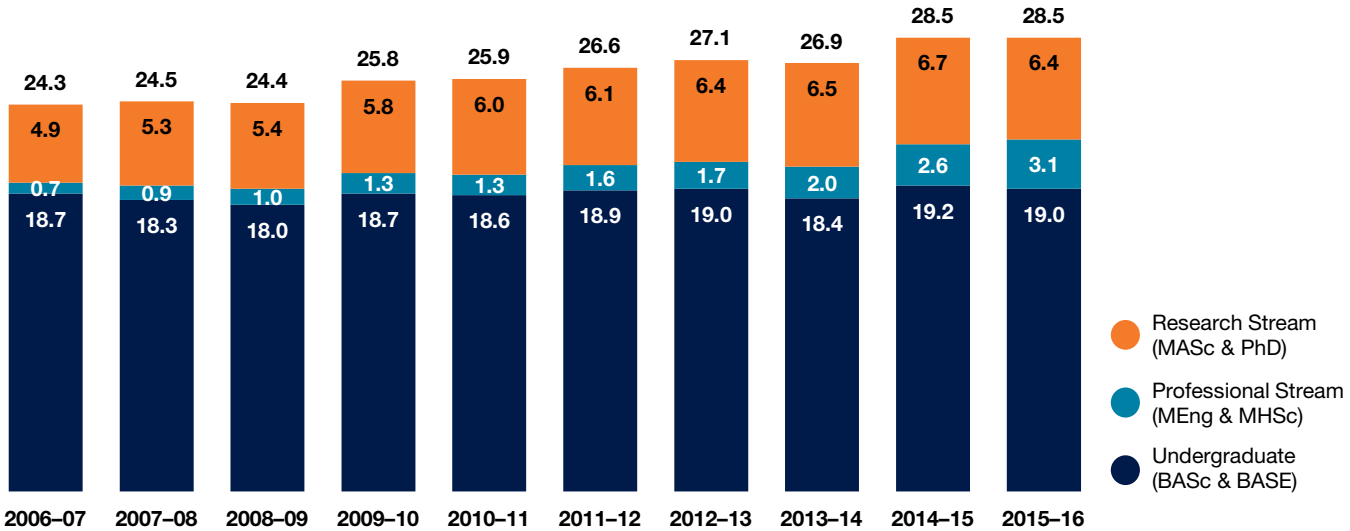


Figure 2.2a **Undergraduate and Graduate Full-Time Equivalent Students per Faculty Member, 2006–2007 to 2015–2016**



Note 2.2a: To allow more accurate comparisons, undergraduate FTEs are determined by counting each part-time student as 0.3 FTE.

Figure 2.2b **Ratio of Undergraduate to Graduate Full-Time Equivalent Students, 2006–2007 to 2015–2016**

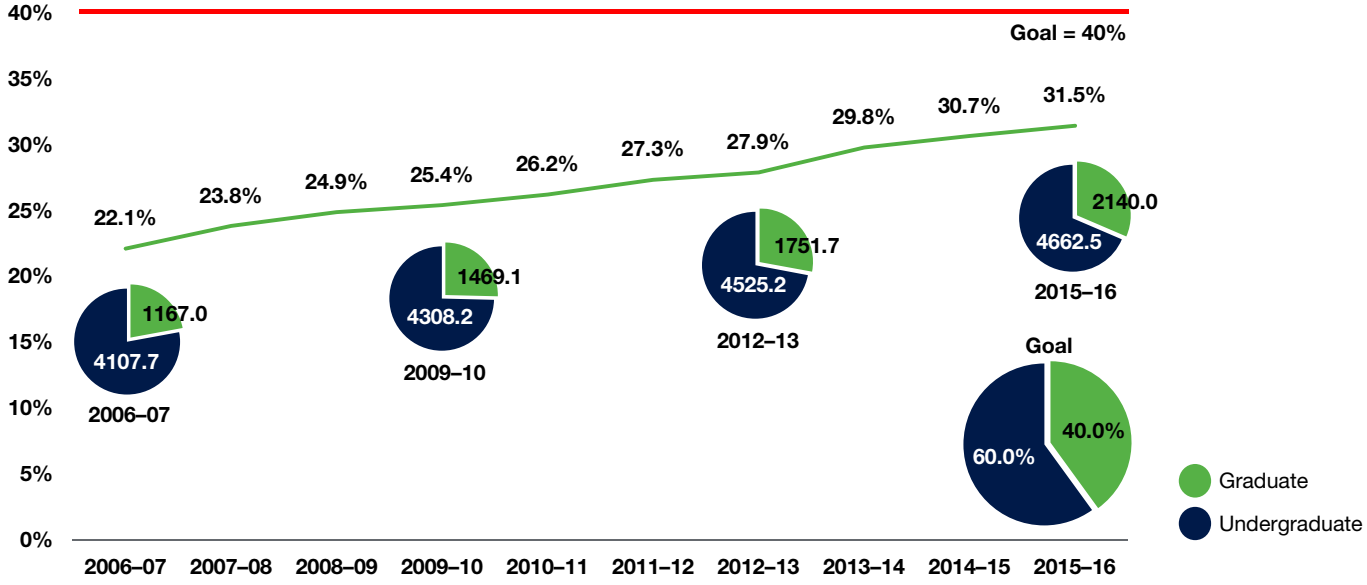
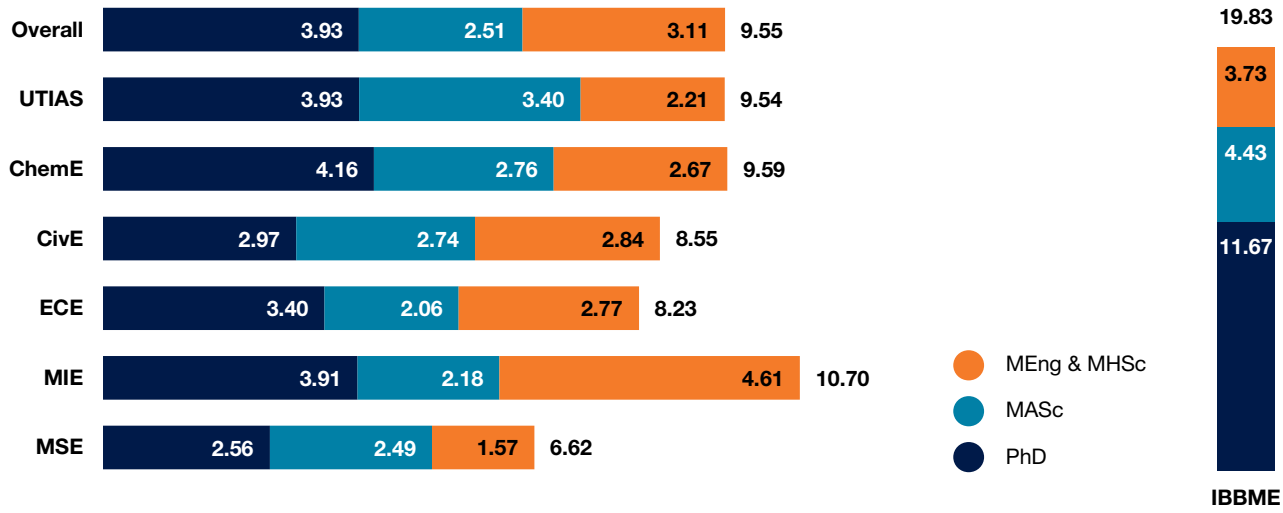


Figure 2.2c **Full-Time Equivalent Graduate Students per Faculty Member by Academic Area and Degree Type, 2015–2016**



Note 2.2b: Students on Professional Experience Year placements are not included in this count.
Note 2.2c: Some students in IBBME are supervised by faculty members from the Faculties of Medicine and Dentistry and affiliated hospitals, as well as from other departments within U of T Engineering. Because the ratio includes only faculty with a budgetary appointment in IBBME, comparisons with other Engineering departments are not possible. For that reason, this figure shows IBBME in a visually distinct way. In cases of inter-departmental supervision within the Faculty, PhD and MASc students are assigned 100 per cent to their primary supervisors' department.

Admissions and Recruitment

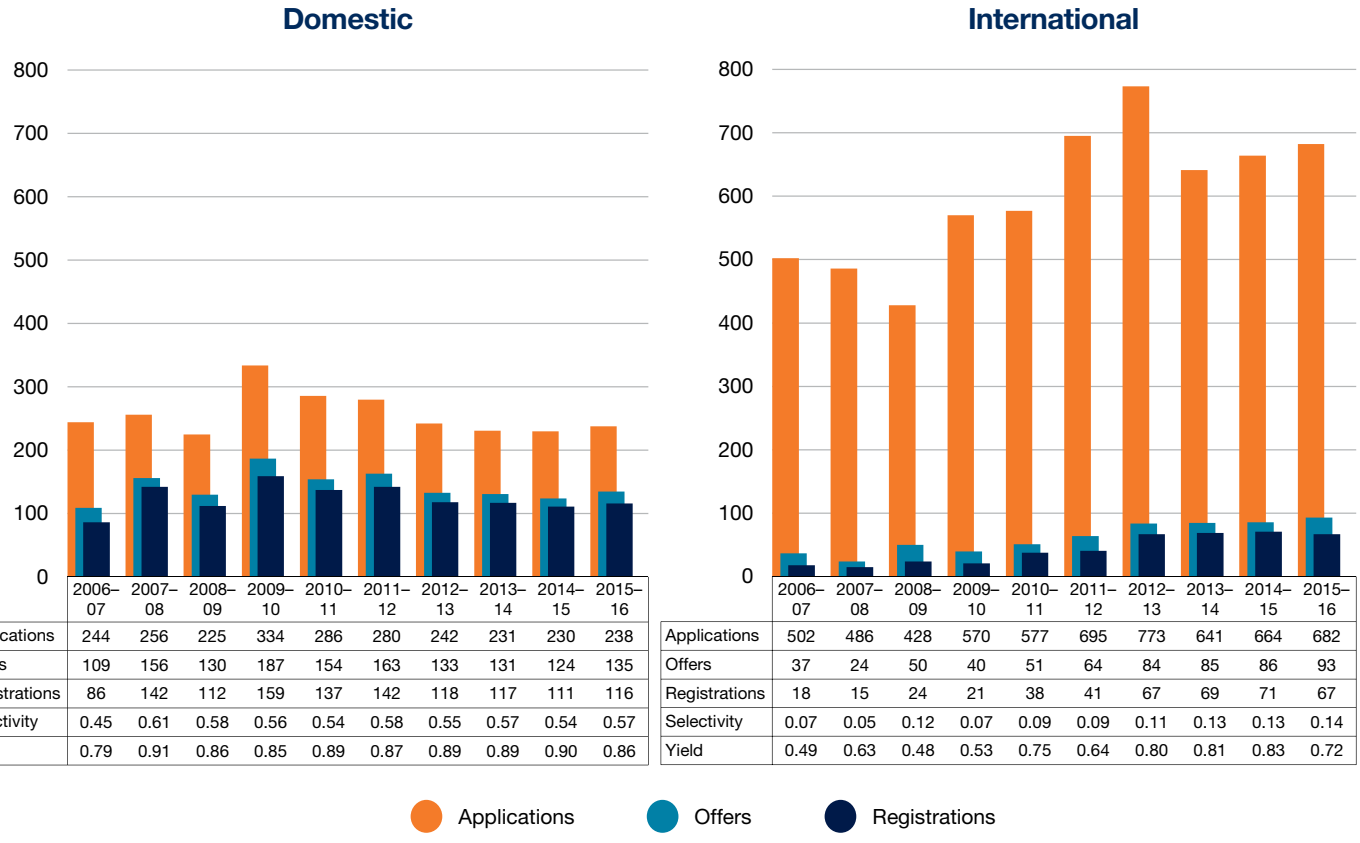
Applications to our graduate programs reflected growing demand for programs of study that offer advanced technical and professional competencies, as well as strong interest from international students.

We experienced robust growth in our MEng program, particularly among international students, as we enhanced and expanded our offerings. Applications from international candidates increased by 25 per cent compared with 2014–2015, and international students made up 41 per cent of new registrations, up from 37 per cent the previous year and 12 per cent a decade ago. Domestic applications increased by five per cent over the previous year.

Applications and enrolment in our research-stream MASc remained steady, as more students who do not foresee enrolling in a PhD program chose to pursue a MEng instead.

The total number of new students entering PhD programs this year was similar to the level of the last five years and the proportion of incoming international PhD students has remained steady between 35 and 40 per cent over that time. We are making progress in enabling talented researchers to maximize their contributions by increasing the number who fast-track from MASc programs into PhD programs, or who enter PhD programs directly after completing their undergraduate degrees.

Figure 2.3 Applications, Offers, Registrations, Selectivity and Yield of PhD Students, 2006–2007 to 2015–2016



Domestic

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Applications	244	256	225	334	286	280	242	231	230	238
Offers	109	156	130	187	154	163	133	131	124	135
Registrations	86	142	112	159	137	142	118	117	111	116
Selectivity	0.45	0.61	0.58	0.56	0.54	0.58	0.55	0.57	0.54	0.57
Yield	0.79	0.91	0.86	0.85	0.89	0.87	0.89	0.89	0.90	0.86

International

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Applications	502	486	428	570	577	695	773	641	664	682
Offers	37	24	50	40	51	64	84	85	86	93
Registrations	18	15	24	21	38	41	67	69	71	67
Selectivity	0.07	0.05	0.12	0.07	0.09	0.09	0.11	0.13	0.13	0.14
Yield	0.49	0.63	0.48	0.53	0.75	0.64	0.80	0.81	0.83	0.72

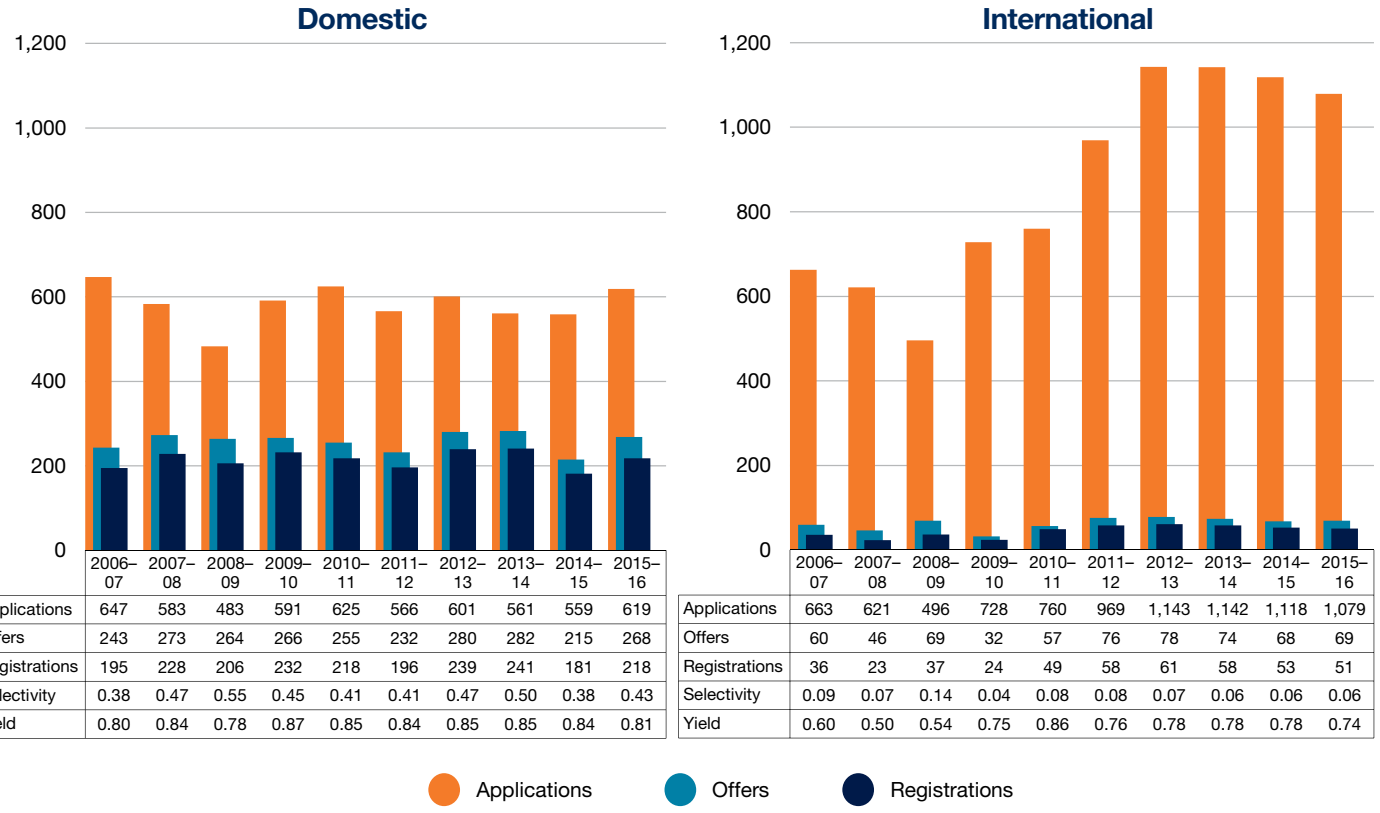
Note 2.3: Student counts are shown as of November 1. Selectivity = offers ÷ applications and represents the proportion of applicants who were offered admission. Yield = registration ÷ offers. Domestic students are defined as citizens (living in Canada or abroad) or permanent residents of Canada. Students who have fast-tracked from MASc programs into PhD programs are counted in this figure as applications, offers and admissions. This is a change from previous annual reports.

To encourage more domestic candidates to apply to our research-stream programs, we target top candidates from across Canada through a number of strategic initiatives:

- For the third year, we partnered with Canada's top engineering schools through the Canadian Graduate Engineering Consortium to hold the U of T Graduate Engineering Fair and six similar events across the country in fall 2015. This initiative, which included stops at U of T, the University of Alberta, the University of Calgary, the University of British Columbia, Queen's University, McGill University and the University of Waterloo, enabled us to reach more highly qualified students to promote the benefits of graduate education and the strengths of U of T Engineering.
- In February 2016, we hosted 127 top students from other Canadian universities at our second Graduate Research Days event. We provided opportunities for these students to learn more about our programs, discover the innovative research of our faculty members and graduate students and meet prospective supervisors.

In addition to marketing our graduate programs in traditional print and online platforms, for the first time we also launched a graduate studies e-marketing campaign that used the web and social media to target engineering students across Canada. Our general graduate studies campaign ran from November 2015 to January 2016 and the MEng campaign from February to May 2016. We will evaluate the success of these campaigns after the 2016 recruitment cycle.

Figure 2.4 Applications, Offers, Registrations, Selectivity and Yield of MASc Students, 2006–2007 to 2015–2016

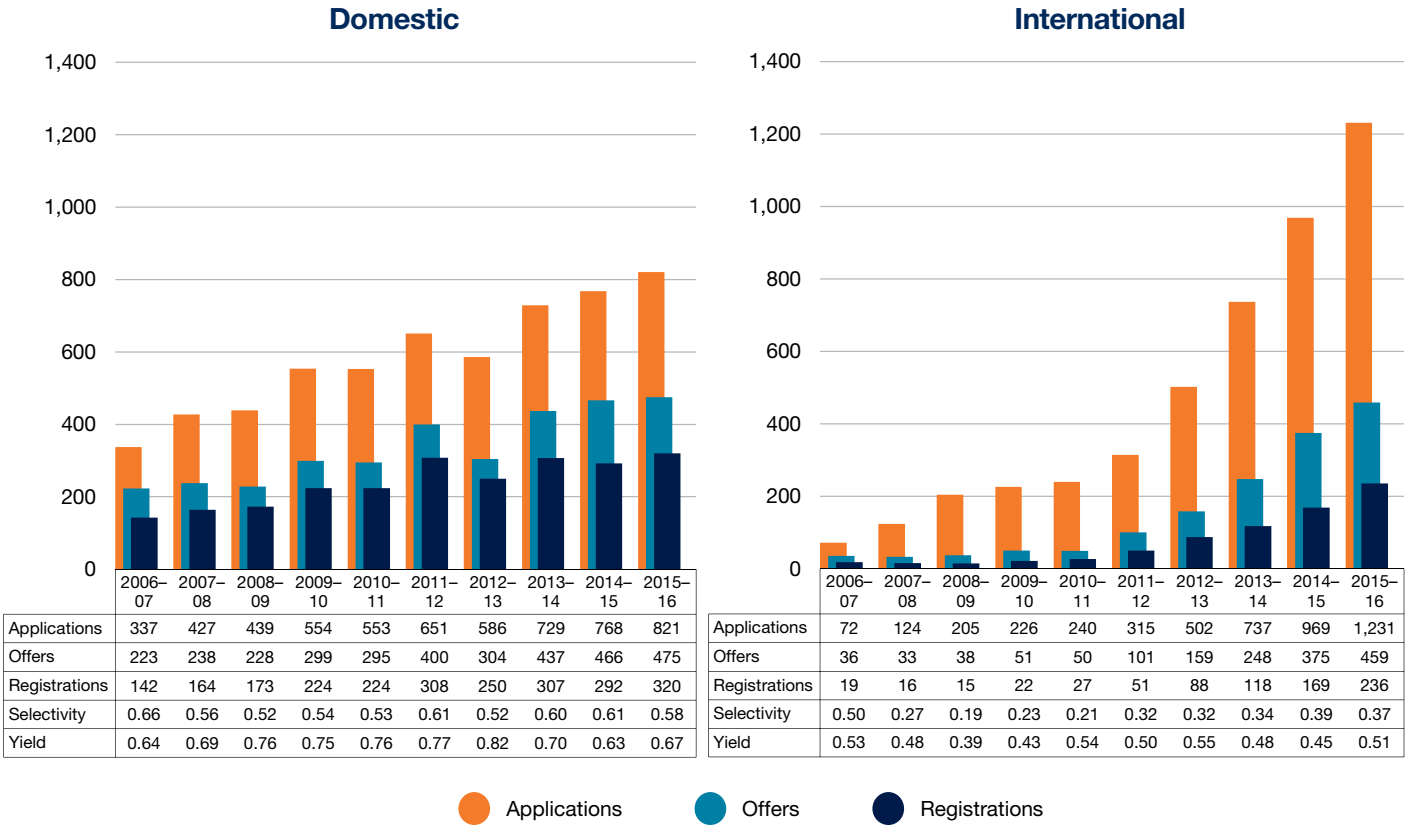


Domestic	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Applications	647	583	483	591	625	566	601	561	559	619
Offers	243	273	264	266	255	232	280	282	215	268
Registrations	195	228	206	232	218	196	239	241	181	218
Selectivity	0.38	0.47	0.55	0.45	0.41	0.41	0.47	0.50	0.38	0.43
Yield	0.80	0.84	0.78	0.87	0.85	0.84	0.85	0.85	0.84	0.81

International	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Applications	663	621	496	728	760	969	1,143	1,142	1,118	1,079
Offers	60	46	69	32	57	76	78	74	68	69
Registrations	36	23	37	24	49	58	61	58	53	51
Selectivity	0.09	0.07	0.14	0.04	0.08	0.08	0.07	0.06	0.06	0.06
Yield	0.60	0.50	0.54	0.75	0.86	0.76	0.78	0.78	0.78	0.74

Note 2.4: Student counts are shown as of November 1. Selectivity = offers ÷ applications and represents the proportion of applicants who were offered admission. Yield = registration ÷ offers. Domestic students are defined as citizens (living in Canada or abroad) or permanent residents of Canada.

Figure 2.5 **Applications, Offers, Registrations, Selectivity and Yield of MEng and MHSc Students, 2006–2007 to 2015–2016**



Domestic	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Applications	337	427	439	554	553	651	586	729	768	821
Offers	223	238	228	299	295	400	304	437	466	475
Registrations	142	164	173	224	224	308	250	307	292	320
Selectivity	0.66	0.56	0.52	0.54	0.53	0.61	0.52	0.60	0.61	0.58
Yield	0.64	0.69	0.76	0.75	0.76	0.77	0.82	0.70	0.63	0.67

International	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Applications	72	124	205	226	240	315	502	737	969	1,231
Offers	36	33	38	51	50	101	159	248	375	459
Registrations	19	16	15	22	27	51	88	118	169	236
Selectivity	0.50	0.27	0.19	0.23	0.21	0.32	0.32	0.34	0.39	0.37
Yield	0.53	0.48	0.39	0.43	0.54	0.50	0.55	0.48	0.45	0.51

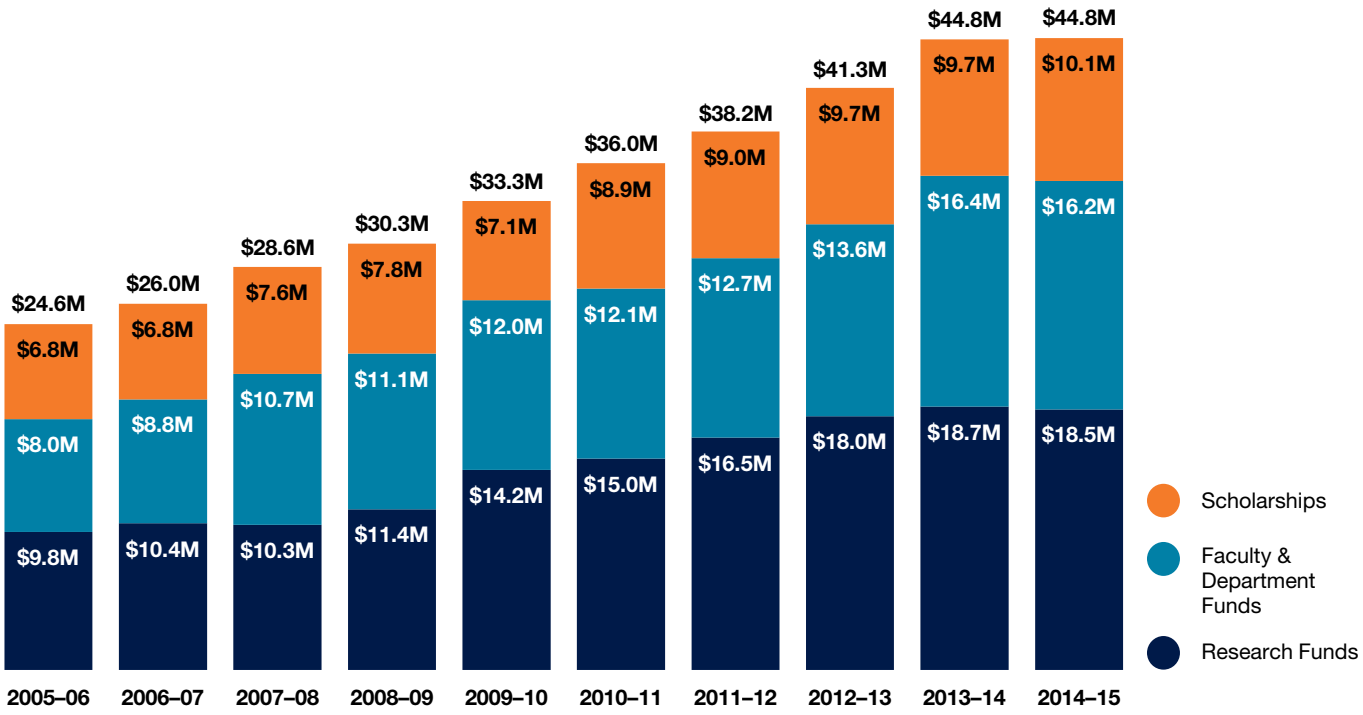
Note 2.5: Student counts are shown as of November 1. Selectivity = offers ÷ applications and represents the proportion of applicants who were offered admission. Yield = registration ÷ offers. Domestic students are defined as citizens (living in Canada or abroad) or permanent residents of Canada.

Funding

Overall graduate student funding for 2014–2015 remained level compared with 2013–2014 (Figure 2.6a). This was influenced by two factors: firstly, the total number of funded graduate students (MASc and PhD) grew by only two per cent from 2013–2014 to 2014–2015. Secondly, a job action in the Winter 2015 term affected earnings for teaching assistants. Total scholarship funding increased by four per cent in 2014–2015 over 2013–2014. This includes the NSERC, Ontario Graduate Scholarships (OGS) and other external scholarships shown in Figure 2.7a, plus a variety of other U of T scholarships.

With a slight decline in NSERC funding, more students are taking up OGS, as well as scholarships from other external sources, including the Canadian Institutes of Health Research (CIHR) and the Ontario Trillium Scholarships.

Figure 2.6a **Graduate Student Funding by Category, 2005–2006 to 2014–2015**



Note 2.6a: Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. For more information, see Data Sources.

Figure 2.6b **Graduate Student Funding by Category and Academic Area, 2014–2015**

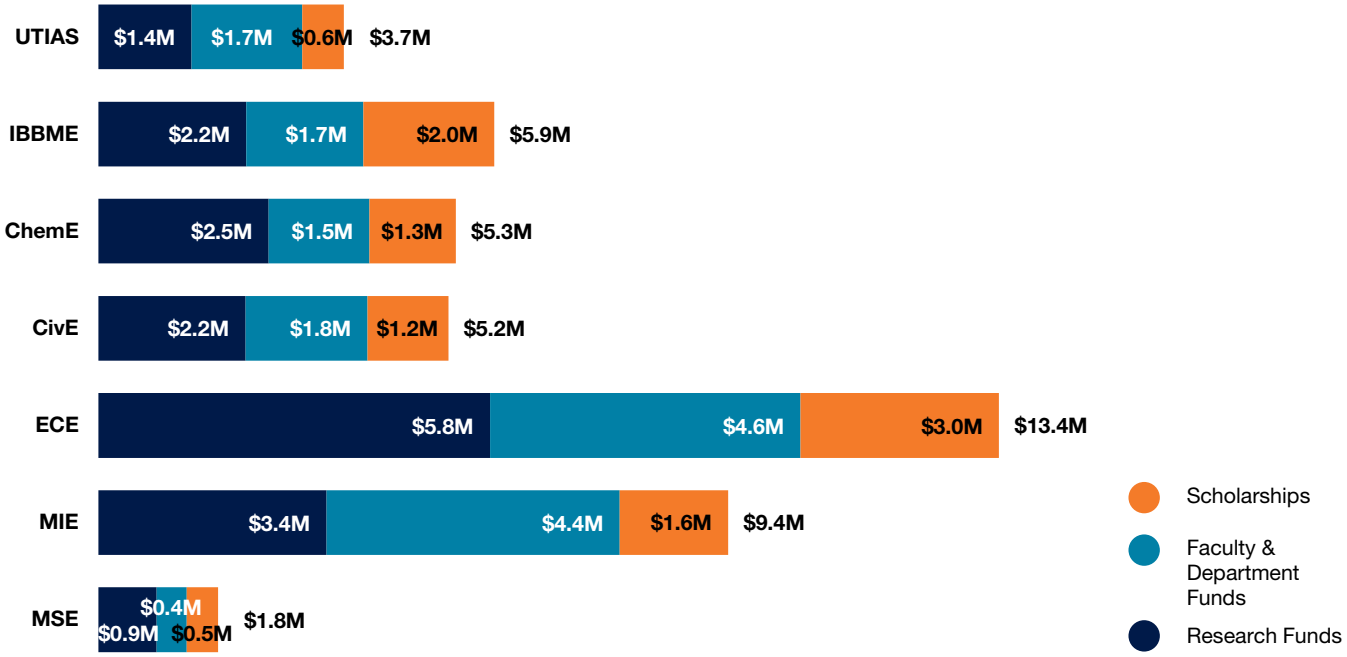
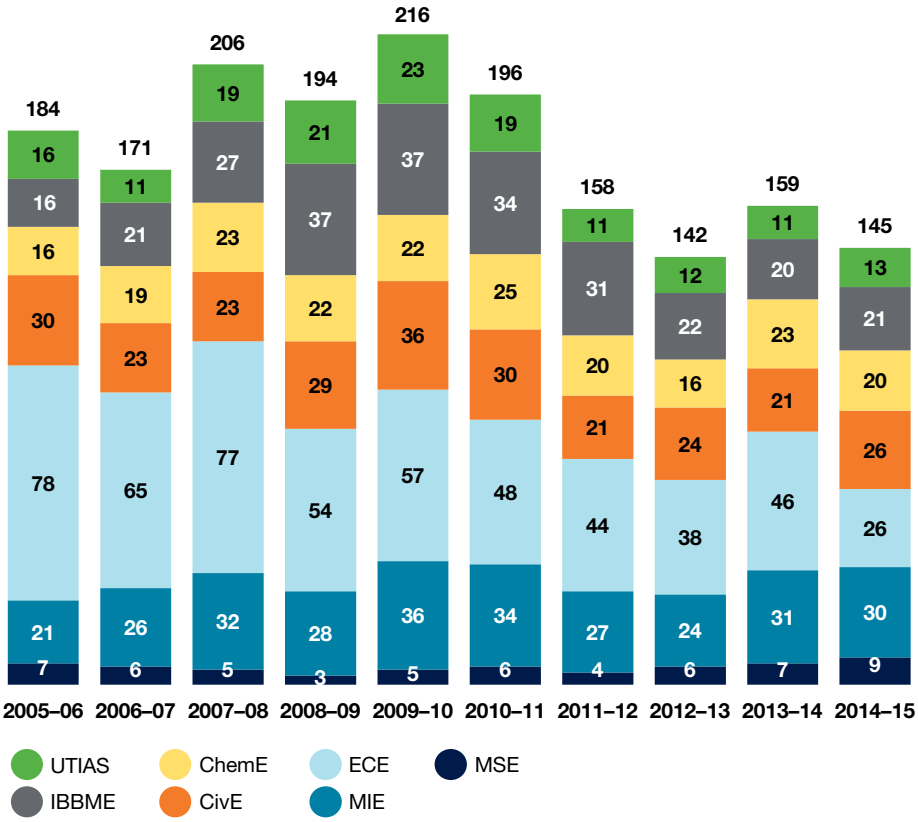


Figure 2.7a **Total External Graduate Student Scholarships by Source, 2005–2006 to 2014–2015**

	NSERC	OGS	External-Other	Total
2005–2006	$3,400,236	$1,106,665	$23,500	$4,530,401
2006–2007	$3,228,150	$1,088,332	$31,100	$4,347,582
2007–2008	$3,827,494	$930,000	$68,167	$4,825,661
2008–2009	$3,737,157	$868,332	$111,770	$4,717,259
2009–2010	$4,393,513	$853,334	$203,167	$5,450,014
2010–2011	$4,396,617	$1,036,675	$179,580	$5,612,872
2011–2012	$3,765,883	$1,593,328	$256,860	$5,616,071
2012–2013	$3,374,183	$1,583,333	$285,501	$5,243,017
2013–2014	$3,759,671	$1,236,666	$582,170	$5,578,507
2014–2015	$3,458,779	$1,333,336	$877,587	$5,669,702

Note 2.6b: Data were obtained from the new Student Accounts Reporting Cube. Data for previous annual reports were obtained from the Graduate Student Income Reporting Cube. For more information, see Data Sources.
Note 2.7a: Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. For more information, see Data Sources.

Figure 2.7b **Number of NSERC Graduate Student Award Recipients by Academic Area, 2005–2006 to 2014–2015**



Note 2.7b: Data reported by academic year (September to August).

Graduate Studies Completion

From 2013 to 2016, the number of fast-tracking students has grown by about 20 per cent compared with the three years from 2010 to 2013 (Figure 2.8a). The direct-entry option has been used by relatively few students in the past, but last year the number of direct-entry PhD students more than tripled to 24. These changes emphasize the value of the engineering PhD as the best option for students interested in research. The average duration of degrees remains on par with previous years (Figure 2.9). *For complete information on time to completion for all academic areas, see Appendix C.*

Figure 2.8a **Number of Students Fast-Tracked from MASc to PhD by Academic Area, 2006–2007 to 2015–2016**

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
UTIAS	1	2	8	6	5	2	5	6	10	1
IBBME	2	8	4	12	8	5	9	9	11	15
ChemE	7	4	6	11	5	8	7	14	8	6
CivE	5	4	4	3	2	5	2	3	1	5
ECE	2	2	0	1	6	4	2	4	5	4
MIE	3	8	5	7	6	6	6	5	3	9
MSE	2	2	3	1	3	7	1	3	4	1
Total	**22**	**30**	**30**	**41**	**35**	**37**	**32**	**44**	**42**	**41**

Figure 2.8a **Number of Direct-Entry PhD Students by Academic Area, 2008–2009 to 2015–2016**

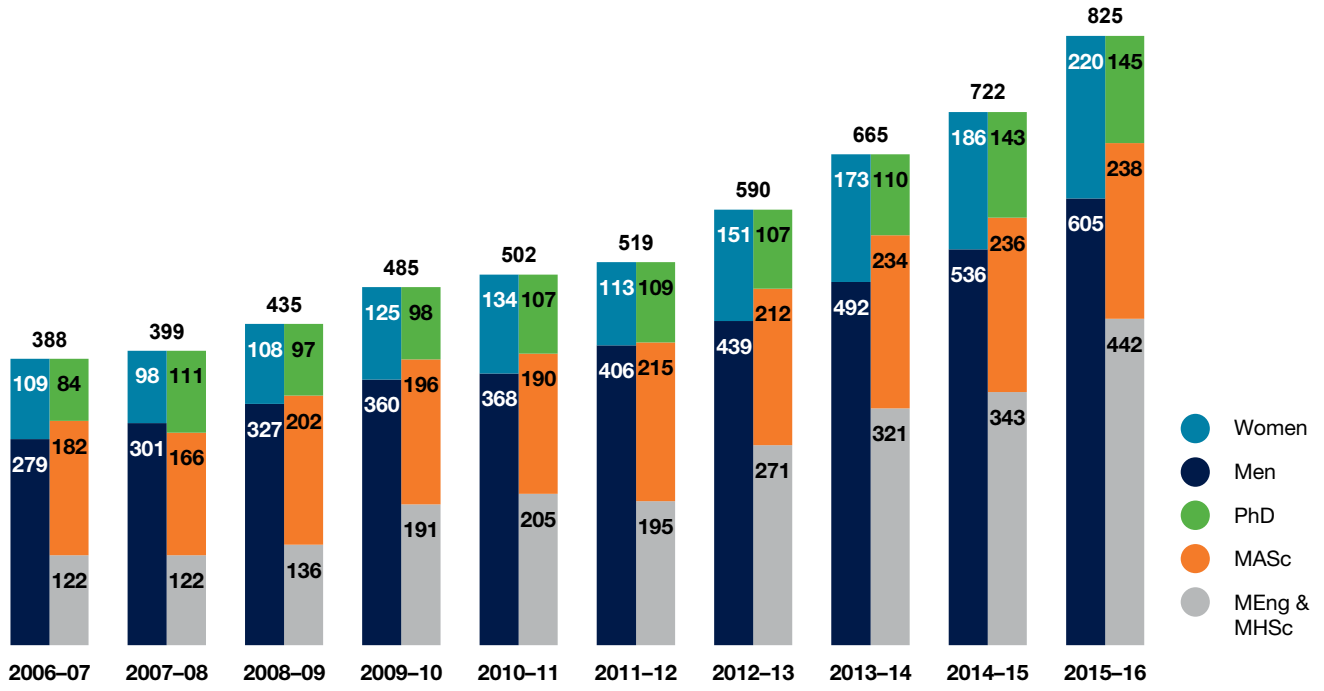
	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
UTIAS								2
IBBME	2	6	6	8	7	7	3	10
ChemE			1	1	1			9
CivE			1	1				
ECE				1			2	3
MIE			1	1	3		2	
MSE		1		1				
Total	**2**	**7**	**9**	**13**	**11**	**7**	**7**	**24**

Note 2.8a and b: For counting purposes, the academic year is from May to April.

Figure 2.9 **Time to Graduation for PhD, MASc, MEng and MHSc Students, 2006–2007 to 2015–2016**

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
PhD	5.0	4.7	4.7	4.7	5.3	5.0	5.3	5.2	5.3	5.3
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MEng & MHSc (FT)	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0	1.0	1.0
MEng & MHSc (ExtFT)									1.3	1.7
MEng & MHSc (PT)	2.0	2.0	2.3	2.3	2.3	2.0	2.0	2.0	2.0	2.0

Figure 2.10 **Graduate Degrees Awarded by Degree Type and Gender, 2006–2007 to 2015–2016**



Enriching the Graduate Student Experience

We continually enhance our curricular and co-curricular offerings to ensure our graduate students receive the most rigorous and comprehensive preparation possible, whether they aspire to work in academia, industry or other fields.

Our innovative professional master's programs allow students to gain specialized technical knowledge and develop leadership and other professional competencies to advance their careers. MEng students apply through one of seven departments and can choose from among a growing number of optional emphases, including sustainable energy and advanced manufacturing. The most popular of these emphases is the Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) Certificate, which enhances students' professional competencies with a range of courses on business, finance, leadership and management. In 2015–2016, we expanded our ELITE offering to include five new courses:

- APS 1028H Operations and Production Management for Manufacturing and Services;
- APS 1032 Introduction to Energy Project Management;
- APS 1033 Innovation via Imagineering;
- APS 1035 Taking a New Venture to Market; and
- APS 1036 Formative Experiential Entrepreneurial Learning.

Figure 2.11 **ELITE Certificates Awarded, 2008–2009 to 2015–2016**

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
AeroE		1	2		7	2	4	11
ChemE		2	12	11	17	8	20	20
CivE	3	11	13	11	9	12	12	25
ECE		3	3	3	22	32	22	14
MIE		7	19	20	26	36	39	50
MSE			1	1	4	6	11	5
Total	**3**	**24**	**50**	**46**	**85**	**96**	**108**	**125**

We also offer:

- Master of Health Science in Clinical Engineering through the Institute of Biomaterials & Biomedical Engineering;
- MEng in Cities Engineering and Management (MEng CEM), which provides graduates with a fundamental understanding of the complex and cross-disciplinary issues facing cities through a year of course work and a four-month internship with a municipal, university or corporate partner; and
- MEng in Biomedical Engineering, a one-year, full-time program focusing on biomedical devices. Students in this program, which begins in fall 2016, will take on an applied design challenge and meet the growing demands of this industry through a four-month internship.

We continue to enhance experiential learning and entrepreneurship opportunities for all of our graduate students. Co-curricular incubator programs such as Start@UTIAS and The Entrepreneurship Hatchery offer mentoring, expertise and other resources that help students launch startups and bring their innovations to market. The Multidisciplinary MEng Project, offered by the University of Toronto Institute for Multidisciplinary Design & Innovation (UT-IMDI), provides MEng students with the opportunity to apply their knowledge and skills in multidisciplinary teams to address technical research challenges proposed by industry partners. UT-IMDI also offers internships with industry partners for MEng students. MHSc candidates complete the equivalent of eight months of full-time work in internships in clinical engineering as a requirement of their program.

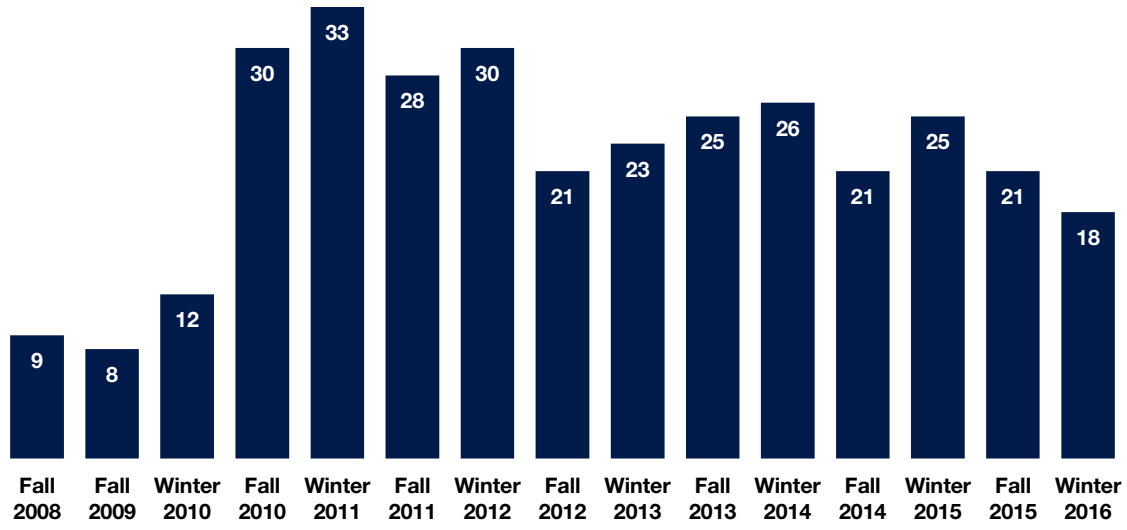
In the fall of 2014, we created the Collaborative Program in Engineering Education (EngEd) for master's and doctoral students from either U of T Engineering or the Ontario Institute for Studies in Education (OISE) to join the small community of scholars immersed in research and learning at the nexus of education and engineering practice. The program is the first of its kind in Canada. In its second year, the enrolment grew from six to 12 students.

We also prepare PhD candidates to apply for — and be successful in — academic positions through the Prospective Professors in Training program. The program includes 13 core seminars on topics including preparing a resume, the interview process, classroom management and starting a research program. The program, which counts toward credits in the Graduate Professional Skills Program offered by the University of Toronto School of Graduate Studies, also includes a full semester course, APS 1203 Teaching Engineering in Higher Education. We are developing a similar program to prepare PhD graduates who will work in industry and other settings.

Since 2008, we have partnered with Magna International to provide Magna employees with a specialized MEng curriculum, including a major technical project. The MEng program for the Stronach Centre for Innovation (MEng, SCFI) continues to show strong demand.

To read more about programs that enrich the graduate student experience, please see Chapter 4: Cross-Faculty Education and Experiential Learning.

Figure 2.12 **MEng, SCFI Program Enrolment, Fall 2008 to Winter 2016**



Selected Graduate Student Highlights

Graduate students compete at 2015 Pan Am Games

Two U of T Engineering graduate students made their mark at the 2015 Pan Am Games before a hometown crowd in Toronto. Sasha Gollish (CivE MEng 1T0, EngEd PhD Candidate) captured a bronze medal on the track in the women's 1,500 metres and was recognized in fall 2015 as one of the Top 8 Academic All-Canadians by Canadian Interuniversity Sport. Donna Vakalis (CivE PhD Candidate) came fourth in the modern pentathlon at the Pan Am Games, in the process securing a berth on the Canadian team at the 2016 Summer Olympics in Rio de Janeiro. Vakalis also competed at the 2012 London Olympics in modern pentathlon, which includes fencing, swimming, riding, running and shooting.

Using game theory to predict electricity demand

Joseph Dongchan Lee (EngSci 1T3 + PEY, ECE MASc 1T6) won the best paper award from the Institute of Electrical and Electronics Engineers (IEEE) 2015 Electrical Power and Energy Conference for research that could help utilities understand how electricity demand changes in response to real-time pricing. Using evolutionary game theory, Lee studied the effect of real-time pricing in electricity consumption patterns and proposed methods for system operators to reduce consumption during peak hours. Lee's current research focuses on automatic monitoring of power quality disturbances in smart grids to increase reliability and system awareness in existing power grids. Lee, a student of Professor Deepa Kundur (ECE), will begin doctoral studies at the Massachusetts Institute of Technology in fall 2016.

PhD candidate wins teaching excellence award

Mario Badr (ElecE 1T1, MASc 1T4) won a 2015 TA Teaching Excellence Award from the University of Toronto's Teaching Assistant Training Program (TATP). Badr, a PhD candidate in The Edward S. Rogers Sr. Department of Electrical & Computer Engineering, was one of just four recipients from among the more than 6,000 teaching assistants across the University. He has served as a teaching assistant for Engineering Strategies and Practice I & II, Computer Fundamentals, Computer Organization and Computer Architecture. The TATP Teaching Excellence Award was created in 2003 to recognize the outstanding contributions of teaching assistants at the University of Toronto.

3

U of T Engineering advances solutions to relevant global challenges through multidisciplinary research that accelerates innovation in areas ranging from sustainable energy to biomedical engineering. Working with colleagues and partners across the Faculty and the University, research hospitals affiliated with U of T and industry partners, our researchers create groundbreaking technologies that improve lives and drive economic growth.

Our Faculty leads a number of initiatives at the intersection of engineering, medicine and clinical practice that have the potential to revolutionize health care. In 2015–2016, U of T Engineering professors were appointed to direct Medicine by Design, a regenerative medicine initiative funded by the largest single grant in U of T's history, and the Translational Biology and Engineering Program, part of the new Ted Rogers Centre for Heart Research. Both enhance opportunities for U of T Engineering researchers to work closely with experts in other disciplines to advance health-related research and clinical innovations.

Within the Faculty, professors and graduate students across all departments and institutes bring together their expertise in multidisciplinary initiatives such as the Centre for Global Engineering and the Institute for Sustainable Energy. Both will become part of the new Centre for Engineering Innovation & Entrepreneurship when it opens in 2017.

Our multidisciplinary approach and the depth and breadth of our research drive our success in attracting research funding and chairs. We achieved a record $31.8 million in Tri-Council funding in 2014–2015. In 2015–2016, we received seven new or renewed Canada Research Chairs, as well as two new Collaborative Research and Training Experience (CREATE) grants from the Natural Sciences and Engineering Research Council of Canada (NSERC).

We engage with more than 300 industry partners in sectors including communications, mining, automotive, health care, information technology and power generation, and leverage these relationships through programs ranging from NSERC's Collaborative Research and Development program to Strategic Partnership Grants and the Strategic Research Network program.

Selected Research Highlights

U of T Engineering Professors Lead Multidisciplinary Research Initiatives

Two U of T Engineering faculty members have been chosen to lead major multidisciplinary initiatives that are bringing together researchers and clinicians to advance innovations in health care.

In July 2015, Professor Craig Simmons (MIE, IBBME) became scientific director of the Translational Biology and Engineering Program (TBEP), which unites leading experts from the Faculties of Applied Science & Engineering, Medicine and Dentistry to enhance discoveries and accelerate new treatments for cardiovascular disease. TBEP is a key component of the Ted Rogers Centre for Heart Research, which was created in November 2014 as a result of an unprecedented $130-million gift from the Rogers family. TBEP is advancing heart research, diagnostics, and regeneration using a comprehensive approach that includes systems and developmental biology, technology innovation and clinical translation. Simmons was named Distinguished Professor of Mechanobiology, beginning on July 1, 2016.

Professor Peter Zandstra (IBBME), Canada Research Chair in Stem Cell Bioengineering, was named executive director of Medicine by Design in January 2016. Medicine by Design is a leading regenerative medicine initiative at the University of Toronto that is designing and manufacturing cells, tissues and organs that can be used in research, drug discovery and clinical treatments. Supported primarily by a $114-million federal grant from the Canada First Research Excellence Fund — the largest single research grant in U of T's history — Medicine by Design brings together more than 50 researchers and clinicians from the University and its affiliated hospitals to collaborate with academic partners, commercialization entities and the private sector. Grants are designed to support new ideas through to clinical trials and commercialization, with an initial round awarded to researchers at the Faculties of Applied Science & Engineering, Medicine, Arts & Science and Pharmacy, as well as Sunnybrook Health Sciences Centre, Mount Sinai Hospital, the Hospital for Sick Children and the University Health Network. The initiative also focuses on recruiting new faculty, enhancing training opportunities for graduate students and postdoctoral fellows, and creating new national and international partnerships in regenerative medicine. In May 2016, Zandstra received the rank of University Professor, an honour that recognizes pre-eminence in a particular field of knowledge.

Seeding New Partnerships

The Faculties of Applied Science & Engineering and Medicine have created EMHSeed, a seed funding program that supports collaborative research projects that bring together co-principal investigators from U of T Engineering, and either the Faculty of Medicine or an affiliated hospital. The program leverages the world-class expertise of U of T and the Toronto Academic Health Science Network, working at the convergence of engineering, medicine and health. It also promotes partnerships that include at least one early career (<10 years) co-principal investigator.

In an initial round of funding announced in March 2016, nine projects received seed grants. One of the successful projects — a collaboration between Professor Joyce Poon (ECE) and Professor Andres Lozano of the Division of Neurosurgery in the Faculty of Medicine — seeks to develop photonic technologies for targeted neuronal stimulation to improve the understanding and treatment of neurological and psychiatric disorders.

Two New CREATE Grants Strengthen Training in Research Commercialization and Entrepreneurship

Professor Peter Herman (ECE) and Professor Milica Radisic (IBBME, ChemE) will lead two new Collaborative Research and Training Experience (CREATE) grants from NSERC, received in April 2016. The goal of the grants — each of $1.65 million over six years — is to train highly qualified students and postdoctoral fellows through innovative programs that encourage collaborative approaches and help new researchers transition into the workplace. Herman, his collaborators and students will build links between academia and photonics companies in order to commercialize discoveries they make in optics. Radisic and her collaborators will train students in biomedical entrepreneurship, including applying for patents, developing business plans and making fundraising pitches. These new team grants bring the number of active CREATE grants at U of T Engineering to eight.

Data in this chapter are presented for the 2014–2015 grant year (April to March). This is the most recent year for which complete data are available. Highlights are from the 2015–2016 academic year (September to August).

Six Engineering Innovations Get Boost from NSERC Strategic Partnership Grants

Six U of T Engineering researchers — four of them in their first decade as faculty members — received 2015 NSERC Strategic Partnership Grants worth a total of more than $2.8 million. Funded projects include new technologies to extract valuable minerals from hazardous mine tailings, and systems to enable cities to repurpose storm water more effectively. The researchers are:

- Professor Mansoor Barati (MSE)
- Professor Aimy Bazylak (MIE)
- Professor Sean Hum (ECE)
- Professor Elodie Passeport (ChemE, CivE)
- Professor Ted Sargent (ECE)
- Professor Costas Sarris (ECE)

Strategic Partnerships Grants seek to increase research and training in targeted areas and enhance Canada's economy, society and environment within the coming decade. The six Engineering researchers were among 10 U of T professors to receive the grants this year.

Seven U of T Professors Receive New or Renewed Canada Research Chairs

In February 2016, seven U of T Engineering professors received significant federal support for their research with new or renewed Canada Research Chairs. The U of T Engineering chairholders are:

- Ya-Huei Cathy Chin (ChemE), Canada Research Chair in Advanced Catalysis for Sustainable Chemistry (Tier 2, new)
- Birsen Donmez (MIE), Canada Research Chair in Human Factors and Transportation (Tier 2, new)
- Andreas Mandelis (MIE), Canada Research Chair in Diffusion-Wave and Photoacoustic Sciences and Technologies (Tier 1, renewal)
- Prasanth Nair (UTIAS), Canada Research Chair in Computational Modelling and Design Under Uncertainty (Tier 2, renewal)
- Elodie Passeport (ChemE, CivE), Canada Research Chair in Environmental Engineering and Stable Isotopes (Tier 2, new)
- Matthew Roorda (CivE), Canada Research Chair in Freight Transportation and Logistics (Tier 2, new)
- David Sinton (MIE), Canada Research Chair in Microfluidics and Energy (Tier 1, new)

The seven engineering chairholders joined 27 others from Faculties across the University of Toronto who were announced at the same time. Launched in 2000, the Canada Research Chairs program is aimed at helping the country attract and retain research leaders in engineering and natural sciences, health sciences, humanities and social sciences. Tier 1 Chairs have a seven-year term, and recognize outstanding researchers acknowledged by their peers as world leaders in their fields. Tier 2 Chairs are for exceptional emerging researchers and have a five-year term. As of April 2016, U of T Engineering held 31 Canada Research Chairs.

Researchers Create New Tool to Understand Cancer Growth

A team of U of T researchers has developed a way to grow cancer cells in the form of a rolled-up sheet that mimics the 3D environment of a tumour, yet can also be taken apart in seconds. The platform, described in a *Nature Materials* paper, has the potential to speed up the development of new drugs and therapies by offering insights into how cancer cells behave.

Professor Alison McGuigan (ChemE, IBBME) and graduate student Darren Rodenhizer (ChemE 1T3, PhD candidate) impregnated a short strip of a porous, paper-like support material with collagen — a gel-like material found in the body — and cancer cells. They bathed it in a nutrient-rich culture solution for a day, allowing the cells to adjust to their new environment. Next, they rolled the strip around a metal core, forming an engineered tumour, and cultured it for a few more days before analyzing the behavior of the tumour cells.

The new technique accurately creates conditions that have proven difficult to replicate with traditional cell cultures in two-dimensional petri dishes. For example, cells near the centre have less access to oxygen and nutrients than those growing near the surface, just as they would in a real tumour. By providing a more realistic model for tumour growth, the device could accelerate the search for new treatments, including more effective drugs and personalized medicine.

"Person-on-a-Chip" Grows Realistic Human Tissues Outside Body

Researchers at U of T Engineering have developed a new way to grow realistic human tissues outside the body. Their "person-on-a-chip" technology, called AngioChip, is a powerful platform for discovering and testing new drugs, and could eventually be used to repair or replace damaged organs.

Professor Milica Radisic (IBBME, ChemE), postdoctoral fellow Boyang Zhang (IBBME 1T6) and their collaborators created a fully three-dimensional structure with blood vessels and a lattice for other cells to attach and grow. Zhang built the scaffold out of POMaC, a polymer that

is both biodegradable and biocompatible. The scaffold is made from a series of thin layers, stamped with a pattern of channels that are each about 50 to 100 micrometres wide. The layers, which resemble computer microchips, are then stacked into a 3D structure of synthetic blood vessels and cross-linked using UV light. When the structure is finished, it is bathed in a liquid containing living cells, which quickly colonize the channels and begin growing just as they would in the human body.

The work, which was published in *Nature Materials,* was produced collaboratively with researchers from across U of T, including Professor Michael Sefton (ChemE, IBBME), Professor Aaron Wheeler (Chemistry, IBBME) and their research teams, as well as researchers from Toronto General Hospital and University Health Network.

Improving Defibrillator Access to Save Lives

U of T Engineering researchers have developed the first mathematical optimization approach to deploying automated external defibrillators (AEDs) that considers not only where the devices are located, but also when host buildings are open.

Christopher Sun (EngSci 1T3 + PEY, MIE PhD candidate), working with Professor Timothy Chan (MIE), director of the Centre for Healthcare Engineering, and collaborators at the Rescu program at St. Michael's Hospital, found that AED coverage diminished by more than eight per cent during the day, 28 per cent in the evening and 48 per cent at night, based on the opening hours of buildings where AEDs are placed. Many AEDs are located in office buildings, schools and recreation facilities, which are open for only a limited period each day.

The placement of AEDs in buildings with limited hours can have an impact on survival for those who suffer cardiac arrests. Over a period of roughly eight years, 2,440 out-of-hospital cardiac arrests occurred in Toronto. Of those that occurred near an AED, approximately one in five occurred when an AED was inaccessible. Previous research had examined where AEDs are placed, but had largely overlooked time factors.

The researchers found their new model provided the largest improvement in coverage during the night, when AED availability and survival are the lowest. The researchers hope their optimization model will help develop policies and guidelines for AED placements around the world, and ultimately save lives.

OCCAM Celebrates Official Opening

The Ontario Centre for the Characterization of Advanced Materials (OCCAM) — a $20-million analytical laboratory at U of T Engineering — officially unveiled its latest capabilities in May 2016. Nearly 200 people attended the event, including faculty from across U of T as well as industry partners and representatives from the centre's funders: the Canada Foundation for Innovation, the Ontario Ministry of Research and Innovation, and Hitachi High Technologies Canada. The facility is a joint initiative between the Departments of Materials Science & Engineering and Chemical Engineering & Applied Chemistry. It contains leading-edge equipment for imaging, analyzing and manipulating materials with nanometre-scale precision. Insights gained using these advanced facilities will help researchers understand the natural world and design better devices, from dental implants to microchips, solar cells, aircraft and much more. OCCAM is based on a collaborative model; each year, researchers from across U of T and external industry partners bring hundreds of samples to OCCAM for analysis.

Research Funding and Partnerships

U of T Engineering attracted $78.7 million in research funding in 2014–2015. Our success in this area over the past decade reflects the innovative and collaborative work our investigators are conducting, the strength of our industrial partnerships and more robust fundraising efforts. The Faculty is set for continued growth in research support in light of our recently created Medicine by Design and TBEP programs.

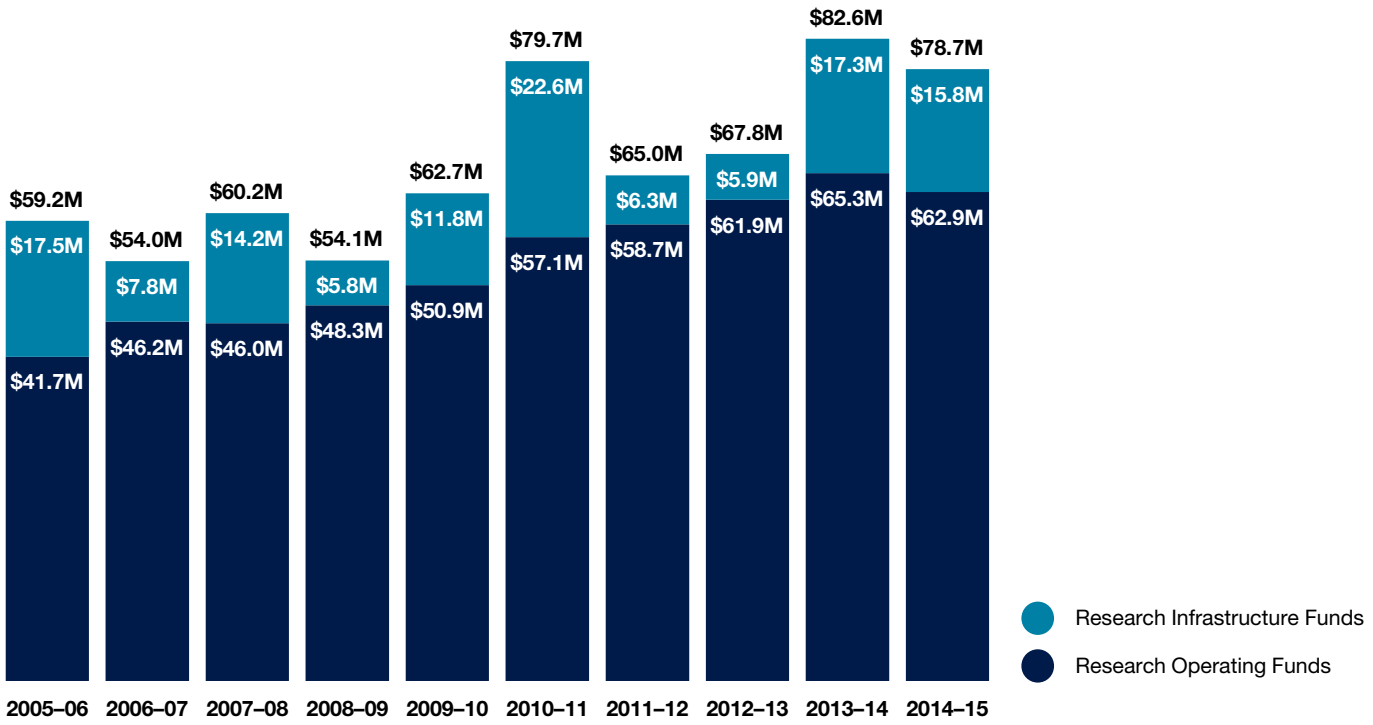
The Faculty achieved a record $31.8 million in Tri-Council funding in 2014–2015, putting us in an excellent position to reach our goal of $32 million by 2015–2016. We increased our goal after reaching our previous Academic Plan target of $25 million in 2012–2013, three years earlier than originally targeted. The Tri-Council includes the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council (SSHRC), plus the Networks of Centres of Excellence (NCE).

Our researchers increased total NSERC support to the Faculty by nine per cent year-over-year to $26.9 million. We also attracted a record amount of funding from CIHR as our Faculty gains increasing recognition for strength in fields such as biomedical engineering and health systems research. Developing additional funding sources is a key goal of our Academic Plan, and enables our excellence in collaborative and multidisciplinary research.

From 2010–2011 to 2014–2015, U of T's five-year cumulative share of NSERC funding was 9.3 per cent, greater than any other Canadian university. The allocation of CRCs to U of T and its divisions is updated every two years and is based on its portion of national Tri-Council funding (including NCE).

On average, each faculty member received $283,273 in annual research funding.

Figure 3.1a **Breakdown of Research Infrastructure Funding vs. Research Operating Funding, 2005–2006 to 2014–2015**



Note 3.1: The figures in this chapter report research funding the Faculty received in 2014–2015. Because it takes some time after the completion of a fiscal year for research funding data to become final, this is the most recent year for which data is available.

Figure 3.1b **Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC) and Networks of Centres of Excellence (NCE) Funding, 2005–2006 to 2014–2015**

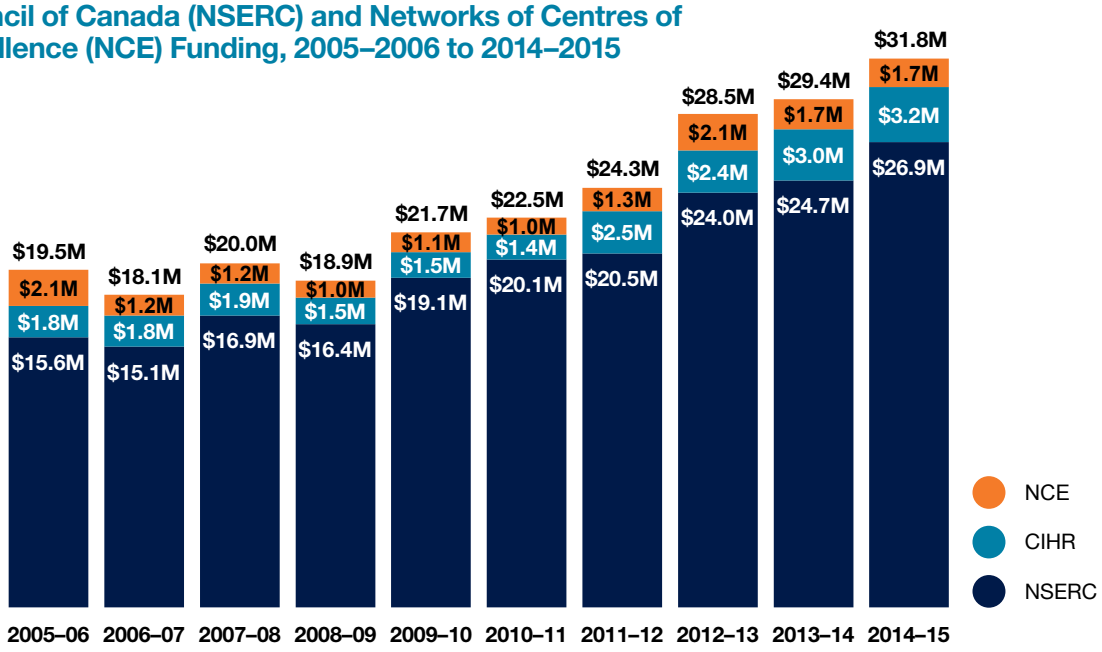
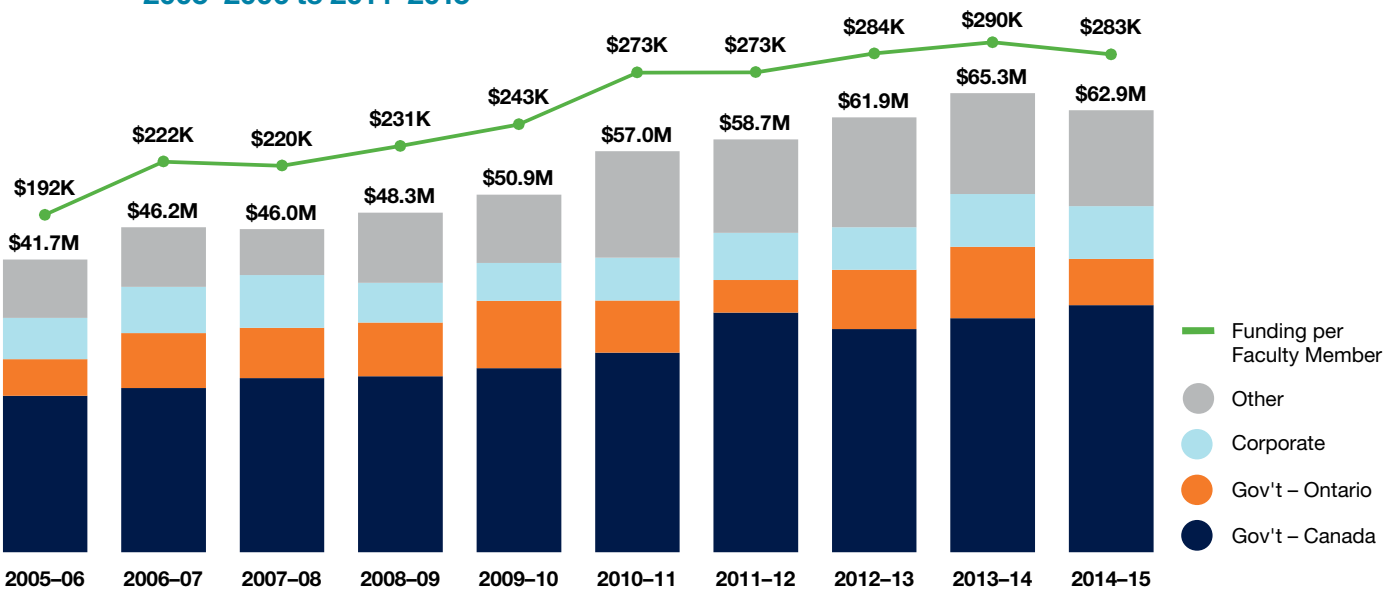


Figure 3.1c **Research Operating Funding by Year, Source and Funding per Faculty Member, 2005–2006 to 2014–2015**



	Funding per Faculty Member	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total
2005–06	$191,956	$22,238,632	$5,241,595	$5,848,143	$8,326,178	**$41,654,548**
2006–07	$222,300	$23,357,386	$7,817,967	$6,583,699	$8,479,398	**$46,238,450**
2007–08	$219,998	$24,763,970	$7,168,950	$7,520,781	$6,525,854	**$45,979,555**
2008–09	$231,217	$25,043,728	$7,618,346	$5,666,153	$9,996,059	**$48,324,286**
2009–10	$243,477	$26,194,223	$9,562,402	$5,415,268	$9,714,802	**$50,886,695**
2010–11	$272,965	$28,404,920	$7,395,585	$6,096,677	$15,152,585	**$57,049,767**
2011–12	$273,182	$34,091,979	$4,636,724	$6,705,219	$13,300,258	**$58,734,180**
2012–13	$283,808	$31,751,929	$8,425,047	$6,062,015	$15,631,214	**$61,870,205**
2013–14	$290,231	$33,297,369	$10,173,279	$7,476,802	$14,354,519	**$65,301,969**
2014–15	$283,273	$35,137,026	$6,594,253	$7,504,880	$13,650,347	**$62,886,506**

The number of research chairs and grants the Faculty receives is one reflection of the exceptional calibre of our investigators and their work.

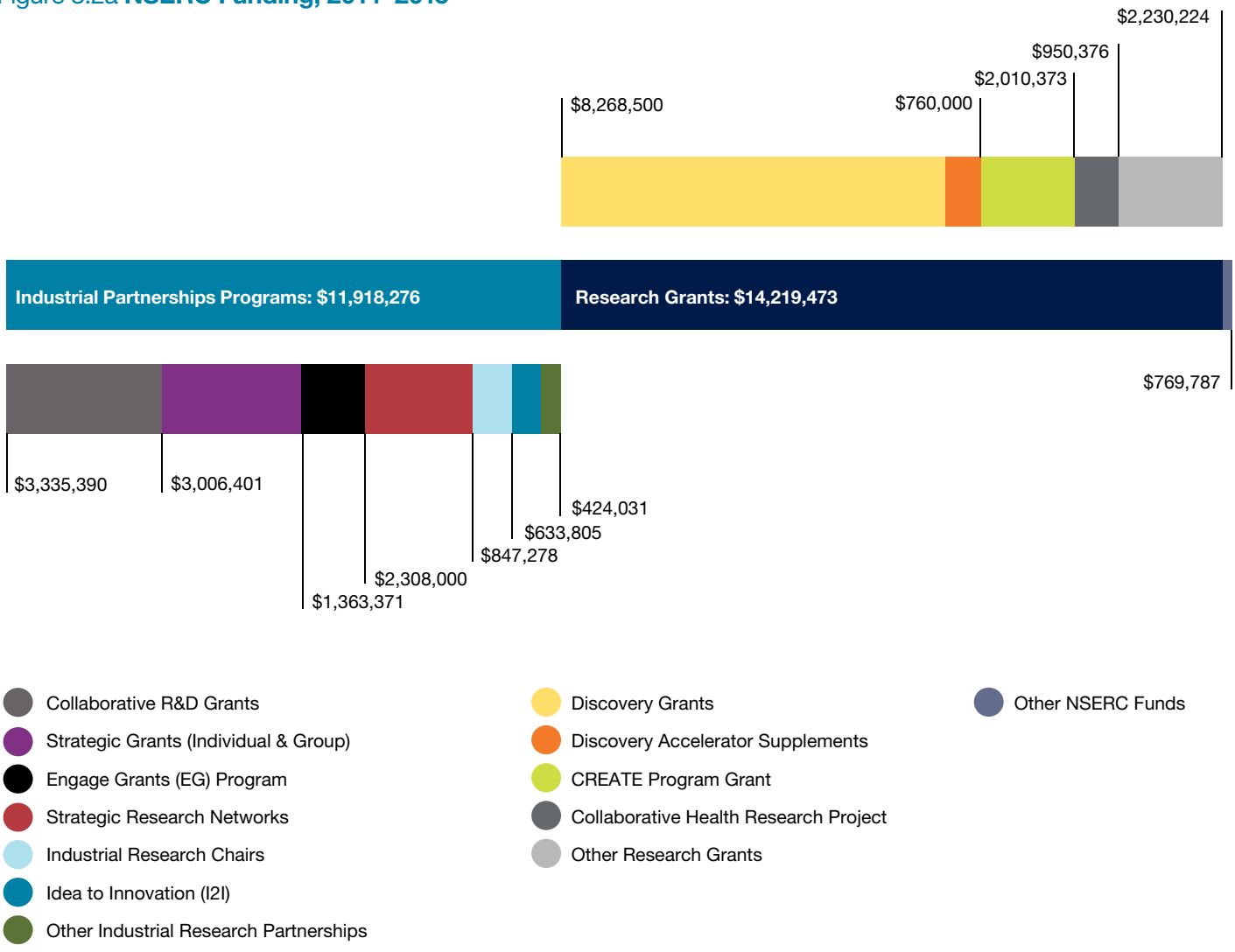
Our Faculty is home to 77 research chairs held by 69 individual chairholders. These chairs include Canada Research Chairs, endowed chairs, NSERC Industrial Research Chairs, U of T Distinguished Professors and University Professors. *For the full list, see Appendix D.*

In 2015–2016, U of T Engineering led eight Collaborative Research and Training Experience (CREATE) grants, including two announced in April 2016. Each of these NSERC grants provides $1.65 million in support over six years, and is aimed at training and mentoring highly qualified students in collaborative and integrative approaches.

Our success in leveraging industrial partnerships has played a key role in the growth we have achieved in NSERC funding over the past decade. It made up 44 per cent of our NSERC funding in 2014–2015. The Faculty attracted six 2015 NSERC Strategic Partnership Grants (SPG) worth a total of $2.8 million, and four of the six awards received by U of T Engineering went to researchers in their first decade as faculty members, including one that was awarded to a faculty member beginning her second year in the tenure stream. To strengthen our industry partnerships, we held workshops for faculty members on attracting industry partners and succeeding in the SPG competition.

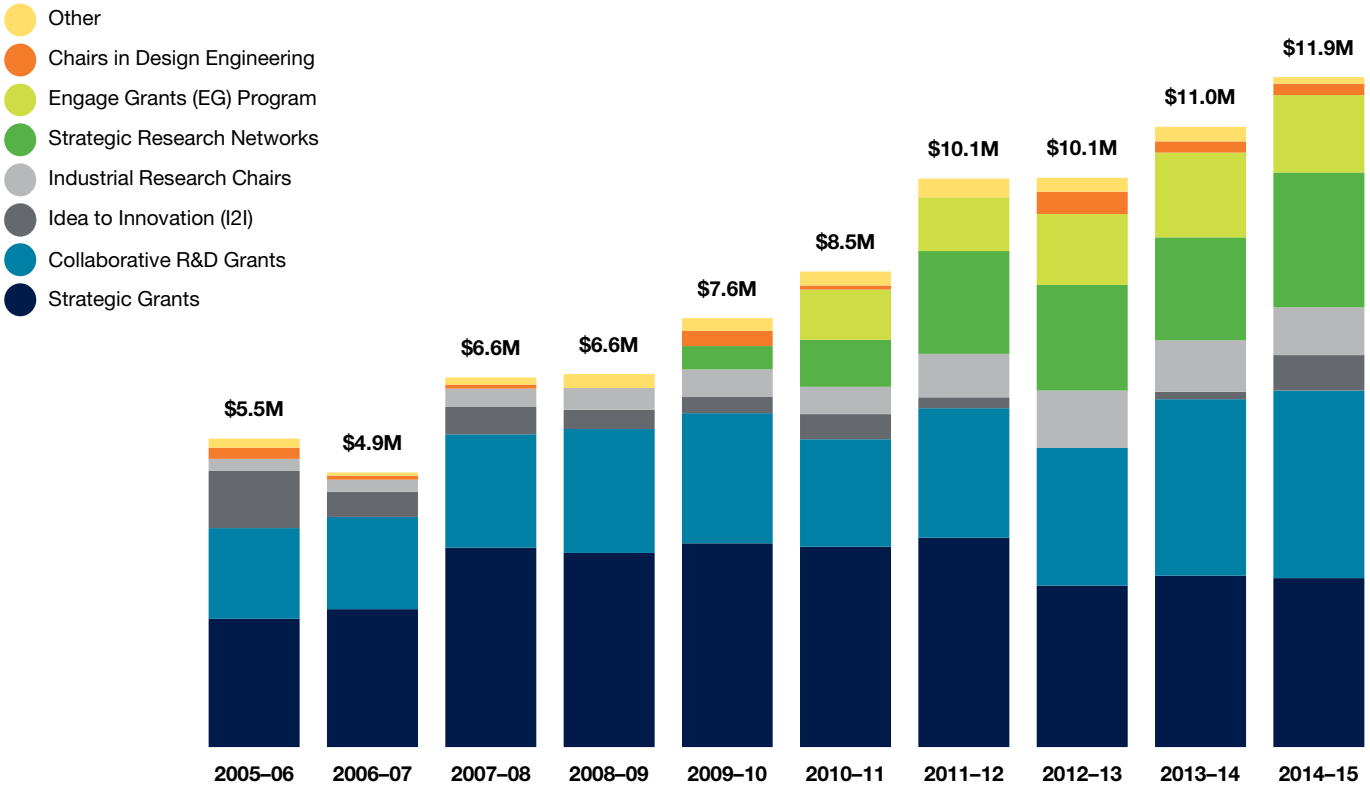
U of T Engineering collaborates in research with more than 300 industry partners, from large multinationals such as Apple, Intel and General Electric to local businesses such as the Greater Toronto Airports Authority (GTAA) and even U of T spinoffs such as Crowdmark. Our partners gain access to our world-class researchers, students and facilities, while the Faculty benefits from mentorship and employment opportunities for students and commercialization expertise.

Figure 3.2a **NSERC Funding, 2014–2015**



Note 3.2a: Data current as of May 2016 and based on grant year (April to March).

Figure 3.2b **NSERC Industrial Partnership Funding by Program, 2005–2006 to 2014–2015**



	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Other	$163,537	$55,267	$130,000	$247,392	$230,000	$251,770	$328,780	$246,790	$258,882	$119,531
Chairs in Design Engineering	$195,437	$69,076	$69,076		$267,173	$69,076		$400,000	$200,000	$200,000
Engage Grants (EG) Program						$897,114	$960,531	$1,254,468	$1,508,924	$1,375,871
Strategic Research Networks					$417,293	$832,697	$1,826,000	$1,879,000	$1,824,940	$2,400,000
Industrial Research Chairs	$211,000	$216,000	$329,834	$390,667	$493,197	$485,711	$773,964	$1,025,031	$918,349	$847,278
Idea to Innovation (I2I)	$1,023,640	$449,032	$483,200	$339,200	$287,417	$448,612	$195,000		$133,750	$633,805
Collaborative R&D Grants	$1,612,412	$1,637,132	$2,015,904	$2,203,103	$2,313,127	$1,909,431	$2,301,643	$2,445,232	$3,137,628	$3,335,390
Strategic Grants	$2,282,310	$2,457,079	$3,549,374	$3,457,330	$3,625,317	$3,567,277	$3,725,049	$2,875,127	$3,050,492	$3,006,401
Total	**$5,488,336**	**$4,883,586**	**$6,577,388**	**$6,637,692**	**$7,633,524**	**$8,461,688**	**$10,110,967**	**$10,125,648**	**$11,032,965**	**$11,918,276**

Figure 3.2c **Industrial Partnerships as a Proportion of Total NSERC Funding, 2005–2006 to 2014–2015**

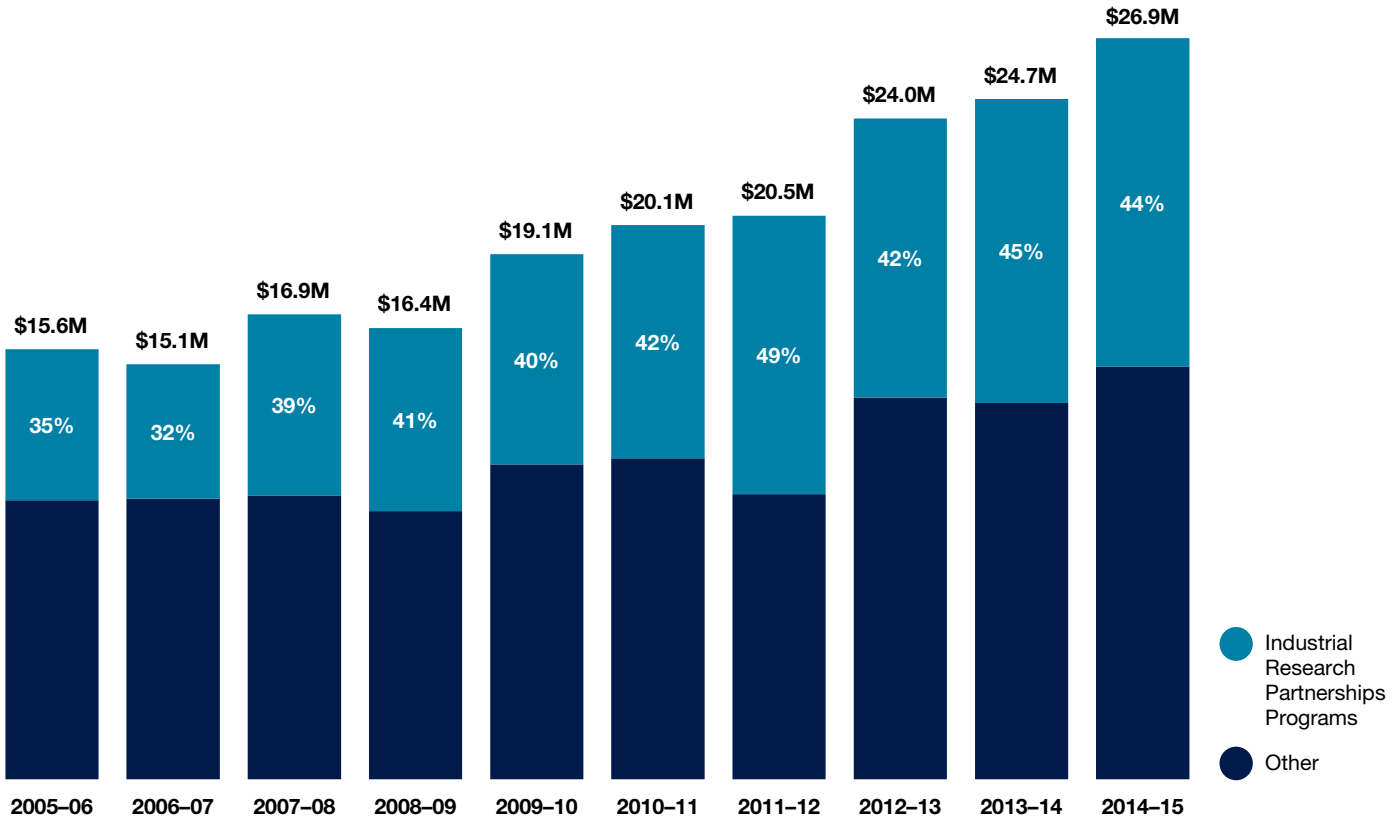


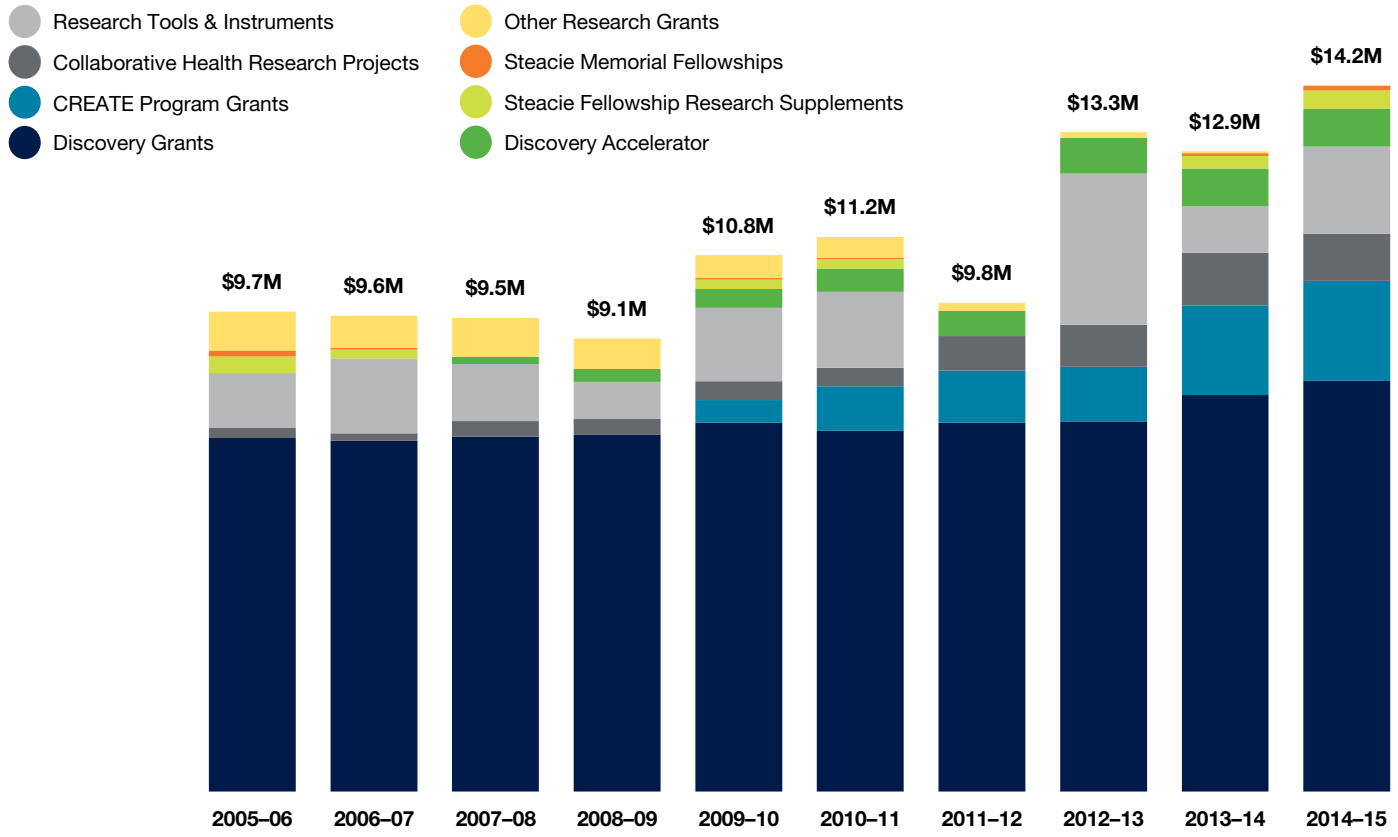
Figure 3.2d **Industry Partners, 2015–2016**

- ABB Group
- Advanced Measurement and Analysis Group Inc.
- Advanced Micro Devices Inc.
- Advanis
- Aerodyne
- AGFA
- Agnico-Eagle Mines Ltd.
- Airbus SAS
- AISC
- Alcan Aluminum International
- Alcohol Countermeasure Systems
- Altera Corp.
- AMAG Ltd.
- AMEC Foster Wheeler
- Americas Styrenics LLC
- Analog Devices Inc.
- Andec Manufacturing Ltd.
- Andritz Group
- Anemoi Technologies Inc.
- Anglo Operations Ltd.
- Angstrom Engineering Inc.
- Antex Western
- Apotex Inc.
- Applanix
- Apple
- Aquafor Beech
- ArcelorMittal Dofasco
- Armacell
- Artium Technologies
- Arup Canada Inc.
- Asahi Glass Co. Ltd.
- Astronauts4Hire
- Atomic Energy of Canada Ltd.
- AUG Signals Ltd.
- Autodesk
- AV Nackawic Group
- Avalon Rare Metals
- Babcock & Wilcox Ltd.
- Barrick Gold Corp.
- Bell Canada
- Bell Helicopter Textron Inc.
- Bickell Foundation (J. P. Bickell)
- BiomeRenewables
- Bio-Rad Laboratories Canada Ltd.
- BlackBerry
- BLiNQ Inc.
- BMW
- Boeing
- Boise Cascade
- Bombardier Aerospace
- Bombardier Inc.
- Braskem
- Brican Automated Systems Inc.
- Brigham & Women's Hospital
- Broadcom Corp.
- CAE
- CalEnergy Generation
- Calgon Carbon Corp.
- Cameco
- Canadian Automobile Association
- Canadian Institute of Steel Construction
- Canadian Nuclear Laboratories
- Canadian Nuclear Safety Commission
- Canadian Renewable Fuels Association
- Canadian Solar Inc.
- Candu Energy Inc.
- Candu Owners Group
- Candura Instruments
- CanSyn Chem Corp.
- Carbon Cure Technologies
- Cardinal Health
- Carter Holt Harvey Ltd.
- Cascades
- CD Nova
- Celestica
- CellScale Biomaterials Testing
- Celulose Nipo-Brasileira
- Cement Association of Canada
- Center for Automotive Materials and Manufacturing
- Centre Line Ltd.
- Christie Digital Systems Canada Inc.
- Chrysler Canada Inc.
- Ciena Canada Inc.
- Clearpath Robotics
- Clyde-Bergemann Inc.
- CMC Electronics
- Colibri Technologies
- COM DEV International Ltd.
- ConCast Pipe
- Connaught Foundation
- Coraltec Inc.
- Corix Water Systems Inc.
- Crosswing Inc.
- Crowdmark
- Cyberworks Robotics
- Cyclone Manufacturing
- Cytodiagnostics
- Daishowa-Marubeni International (DMI) Ltd. – Peace River Pulp Division
- Dana Canada Corp.
- Daniels Group
- Datatrends Research Corp.
- DCL International
- Defence Science & Techology Lab (U.K.)
- Dell
- Detour Gold Corp.
- Deveron
- Dionex
- Diros Technology Inc.
- Dongwon Technology Co. Ltd.
- Dr. Robot Inc.
- Droplet Measurement Technologies
- DSO National Laboratories
- DuPont Canada
- Eclipse Scientific Inc.
- Ecosynthetix
- Eco-Tec Inc.
- Eldorado Brasil
- Electrovaya Inc.
- Eli Lilly Research Laboratories
- Enbridge Gas Distribution Inc.
- Energent Inc.
- Engineering Services Inc.
- ENMAX Power Corporation
- Ensyn Technologies Inc.
- ERCO Worldwide
- Ericsson Canada Inc.
- ESG Solutions
- exactEarth Inc.
- Explora Foundation
- FedEx
- Fibria Celulose
- Finisar Corporation
- Flight Safety International
- Ford Motor Company (U.S.A.)
- Ford Motor Company of Canada
- FP Innovations
- Fuji Electric Co. Ltd.
- Fujitsu Laboratories Ltd.
- Fujitsu Labs of America Inc.
- G. S. Dunn Dry Mustard Millers
- G. Cinelli – Esperia Corporation
- GE Energy
- GE Global Research
- GE Zenon
- Gedex Inc.
- Gener8 Inc.
- General Dynamics Canada
- General Electric Canada
- General Electric Inc.
- General Motors of Canada Ltd.
- Genpak
- Geosyntec Consultants
- Gerdau Long Steel North America
- GlaxoSmithKline Inc.
- Goodrich
- Goodrich Landing Gear
- Grafoid Inc.
- Greencore Composites
- Groupe Mequaltech Inc.
- GTAA Toronto Pearson
- GVA Lighting
- Hamilton Professional Fire Fighters Association
- Hanwha Solar Canada
- Hard Rock Innovations Inc.
- Hatch Ltd.
- Hawker Siddeley Canada
- HDR Corp.
- Hitachi High-Technologies
- Holcim Inc.
- Honeywell
- Huawei Technologies Co. Ltd.
- Hunch Manifest Inc.
- Huron Digital Pathology
- Hydro One Networks
- Hydro Quebec
- Hyundai Motor Company
- IBI Group
- IBM Canada Ltd.
- IBM T. J. Watson Research Center

Note 3.2d: The list above includes companies from U of T's Research Information System, along with collaborators that fund research through a number of industrial research consortia, including those associated with many of our Industrial Research Chairs. It does not include companies that hire our students through the Professional Experience Year, work with them on Multidisciplinary Capstone Projects, or provide philanthropic support.

- iGEN Technologies Inc.
- Imperial Oil Ltd.
- Indian Oil Company
- Industrial Thermo Polymers Ltd.
- Ingenia Polymers Corp.
- Inphi Corp.
- Institute for Energy Technology (Norway)
- Integran Technologies Inc.
- Intel Corp.
- International Paper Company
- Ionicon
- Ionics Mass Spectrometry Group Inc.
- IRISNDT Corp.
- Irving Pulp & Paper Ltd.
- ITS Electronics Inc.
- JDS Uniphase Inc.
- JNE Chemicals
- Johnson Matthey
- Kapik Integration
- Kasai Kogyo Co. Ltd.
- Kevin Quan Studios
- Kiln Flame Systems Ltd.
- Kimberly-Clark Corp.
- Kinectrics
- Kinetica Dynamics
- Klabin
- Krauss Maffei Corp.
- Kumho Petrochemical R & D Center
- LaFarge Canada
- Lallemand Inc.
- Lattice Semiconductor Ltd.
- LG Chem
- Litens Automotive Group
- Lubrizol
- Lumentra Inc.
- MacDonald, Dettwiler and Associates (MDA) Ltd.
- Magellan Aerospace
- Magna Closures
- Magna Exteriors and Interiors
- Magna International Inc.
- Magna Powertrain
- Manitoba Hydro
- Mantech Inc.
- Manulife Financial
- Marmak Information Technologies
- Materials & Manufacturing Ontario
- Maxim Integrated Products Inc.
- MeadWestvaco (MWV) Corp.
- Mercedes-Benz Canada Inc.
- Merrimack Pharmaceuticals Inc.
- Messier-Bugatti-Dowty
- Messier-Dowty Inc.
- Meta North Inc.
- Metso Pulp, Paper and Power
- Microbonds Inc.
- Micropilot
- Millipore
- Mitsubishi Rayon Co. Ltd.
- Moldflow Corp.
- Monaghan Biosciences Ltd.
- Mr. Robot Inc.
- Nanowave
- National Aeronautical Establishment (USA)
- NatureWorks LLC
- NCK Engineering
- Nestle Canada
- Newterra
- Nike Inc.
- Nordion International Inc.
- NUCAP Global
- Nuclear Waste Management Organization
- NXP Semiconductors Netherlands BV
- OCMR
- Olympus Canada
- OneChip Photonics Inc.
- Ontario Clean Water Agency
- Ontario Power Generation Inc.
- Ontario Renal Network
- Ontario Teachers Pension Plan
- Opal-RT Technologies Inc.
- Opus One Solutions Energy Corp.
- ORNGE Medical Transport
- Pall Corporation
- Perkin Elmer Canada
- Pfizer Inc. (New York)
- Plasco Energy Group
- Polaris Industries
- Polycon Industries
- Porewater Solutions
- POSCO Center
- Pratt & Whitney Canada Inc.
- PrecisionHawk
- Process Research Ortech Inc.
- Procter & Gamble
- Prothena Biosciences Inc.
- Purolator
- QD Solar Inc.
- Qualcomm Canada Inc.
- Qualcomm Technologies Inc.
- Quanser Inc.
- Quantum Dental Technologies (QDT) Inc.
- Questor Technologies Inc.
- Quorum Technologies Inc.
- RBC – Royal Bank of Canada
- RBC Capital Markets
- RBC Global Asset Management
- Regeneron Pharmaceuticals
- Research in Motion Ltd.
- Resonance Ltd.
- Resource Systems Group Inc.
- Robert Bosch Corp.
- Rockwell International
- Rocscience Inc.
- Rolls Royce Canada Ltd.
- Rosellini Scientific LLC
- RWDI
- Safety Power Inc.
- Safran Electronics Canada
- Samsung Advanced Institute of Technology
- Samsung Electronics
- Sanofi Pasteur
- Saudi Basic Industries Corp. (SABIC)
- Schlumberger Canada Ltd.
- Sealed Air Corp.
- Semiconductor Research Corp.
- Sendyne Corp.
- Sensor Technology Ltd.
- ShawCor
- Shinil Chemical Industry Co. Ltd.
- Side Effects Software
- Siemens ADGT
- Siltech Corp.
- Sinclair Interplanetary
- Sinclair Technologies Inc.
- Solantro Semiconductor Corp.
- Solar Ship Inc.
- Solvay Specialty Polymers
- Sony Corporation
- SPP Canada Aircraft Inc.
- St Mary's Cement Group
- Stackpole International
- Stantec Inc.
- Steel Structures Education Foundation
- StoraEnso
- Sulzer Metco
- Suncor Energy Inc.
- Sunwell Technologies
- Suzano Papel e Celulose
- Synbra
- Syncrude Canada Ltd.
- Tantalus Rare Earths AG
- Teck Resources Ltd.
- Teknion
- Teledyne ISCO
- TELUS
- TELUS Mobility
- Tembec Industries Inc.
- Tenova GoodFellow Inc.
- Tessonics Inc.
- Thales Canada Inc.
- The Iron Ore Company of Canada (IOC)
- The Miller Group
- Thermodyne Engineering
- ThermoFisher Scientific
- TMS Robotics & Academics
- Tolko Industries Ltd.
- Toronto Hydro
- Toshiba Corp.
- Tower Automotive
- Tower Solutions
- Toyota Collaborative Safety Research Center (CSRC)
- Toyota Technical Center USA Inc.
- TransCanada
- Tridel
- Trojan Technologies Inc.
- TSI Inc.
- Ultrasonix
- Uncharted Software Inc.
- Unisearch Associates
- US Steel Canada
- UTC Aerospace Systems
- VAC Aero International Inc.
- Vale Canada Ltd.
- Valmet Ltd.
- Van-Rob Kirchhoff Automotive
- Varilume Lighting Inc.
- Vicicog
- VisImage Systems Inc.
- Volkswagen Canada Inc.
- VTT Technical Research Centre of Finland
- Westport Innovations
- Whitemud Resources
- Wugang Canada Resources Investment Ltd.
- Wurth Elektronik eiSos GmbH & Co. KG
- Wuzhong Instrument Company
- Xilinx Inc.
- Xiphos Technologies Inc.
- Xstrata Nickel
- Xylitol Canada
- Zotefoams PLC

Figure 3.2e **NSERC Research Grant Funding by Program, 2005–2006 to 2014–2015**



	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15
Other Research Grants	$778,537	$653,000	$781,400	$607,950	$462,319	$422,583	$162,000	$111,000	$40,000	$15,000
Steacie Memorial Fellowships	$120,000	$30,000			$30,000	$30,000			$60,000	$90,000
Steacie Fellowship Research Supplements	$336,477	$179,250			$187,500	$187,500			$250,000	$375,000
Discovery Accelerator Supplements			$144,000	$264,000	$383,999	$464,000	$504,000	$720,000	$760,000	$760,000
Research Tools & Instruments	$1,108,037	$1,510,468	$1,150,928	$734,572	$1,477,018	$1,533,781		$3,043,030	$933,709	$1,750,224
Collaborative Health Research Projects	$197,752	$151,355	$311,245	$326,169	$378,774	$366,899	$696,536	$846,731	$1,064,880	$950,376
CREATE Program Grants					$450,000	$900,000	$1,050,000	$1,096,000	$1,797,084	$2,010,373
Discovery Grants	$7,119,011	$7,057,674	$7,145,644	$7,183,551	$7,429,093	$7,261,603	$7,425,475	$7,452,942	$7,984,878	$8,268,500
Total	**$9,659,814**	**$9,581,747**	**$9,533,217**	**$9,116,242**	**$10,798,703**	**$11,166,366**	**$9,838,011**	**$13,269,703**	**$12,890,551**	**$14,219,473**

Figure 3.3a Canadian Peer Universities vs. University of Toronto Share of NSERC Funding for Engineering Cumulative Five-Year Share, 2010–2011 to 2014–2015

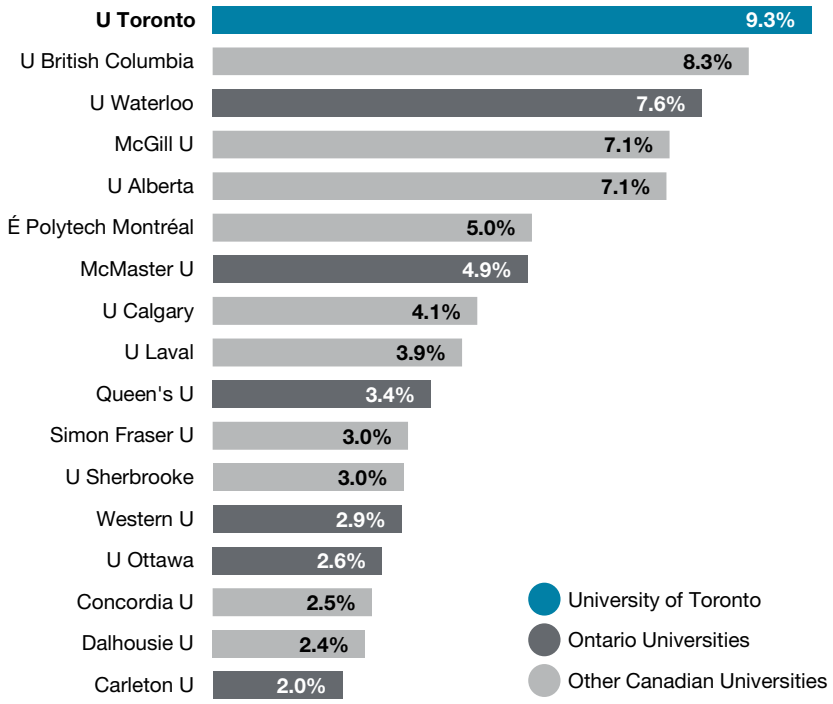


Figure 3.3b U of T Annual Share of NSERC Funding in Engineering, 2005–2006 to 2014–2015

2005–06	9.1%
2006–07	9.0%
2007–08	9.2%
2008–09	8.5%
2009–10	9.4%
2010–11	9.0%
2011–12	9.5%
2012–13	9.0%
2013–14	9.6%
2014–15	9.5%

Figure 3.4a Engineering Invention Disclosures by Academic Area, 2011–2012 to 2015–2016

	2011–12	2012–13	2013–14	2014–15	2015–16	5-Yr Total
UTIAS	1.0	1.0	1.0		1.0	**4.0**
IBBME	14.0	8.2	5.9	6.5	8.0	**42.6**
ChemE	5.8	12.4	10.3	9.0	7.0	**44.5**
CivE	3.3	1.8	5.0	5.0	6.0	**21.1**
ECE	24.5	38.1	16.5	41.6	24.6	**145.3**
EngSci		0.5	1.2		1.0	**2.7**
MIE	20.7	13.1	9.5	18.8	16.8	**78.9**
MSE	3.0	4.0	2.5	1.5	1.3	**12.3**
Annual Total	**72.3**	**79.1**	**51.9**	**82.4**	**65.7**	**351.4**
University Annual Total	**158.0**	**166.0**	**147.0**	**176.0**	**169.0**	**816.0**
Engineering Percentage	**46%**	**48%**	**35%**	**47%**	**39%**	**43%**

U of T Engineering researchers applied for 32 patents in 2015–2016, representing more than 70 per cent of all patent applications across the entire University. Our Faculty also led the way in invention disclosures, accounting for 39 per cent of those made at U of T in 2015–2016 and 43 per cent of those made in the last five years. Within our Faculty, ECE accounted for 37 per cent of invention disclosures in 2015–2016, and MIE accounted for 26 per cent.

Note 3.3a and 3.3b: Data are from the NSERC advanced search website and are shown by NSERC's fiscal year (April to March).

Figure 3.4b **U of T Invention Disclosures by Faculty, 2015–2016**

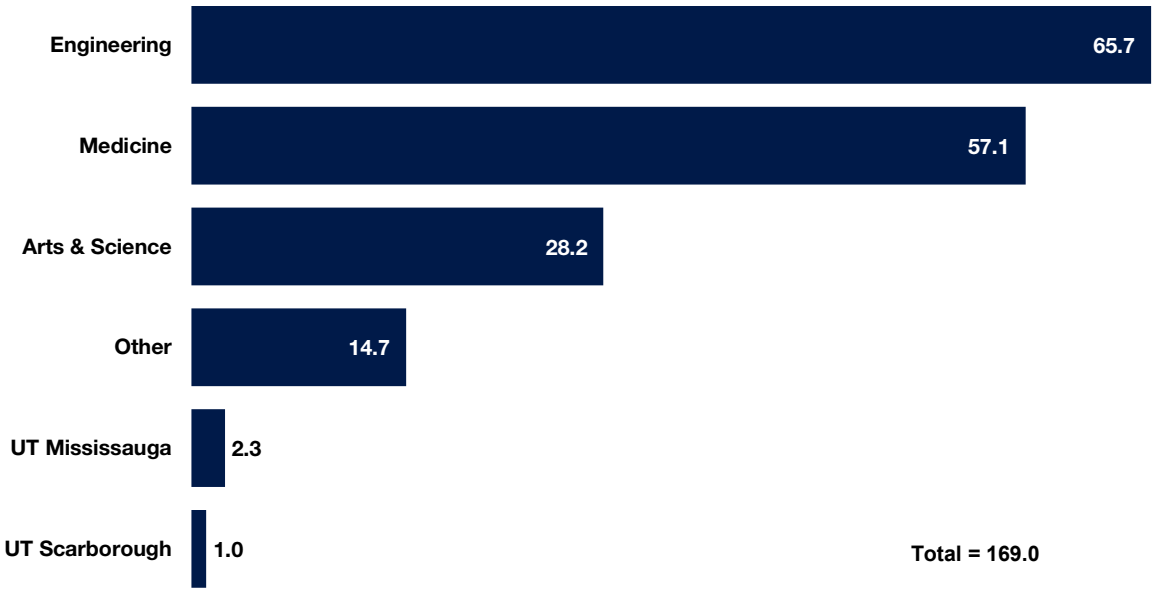
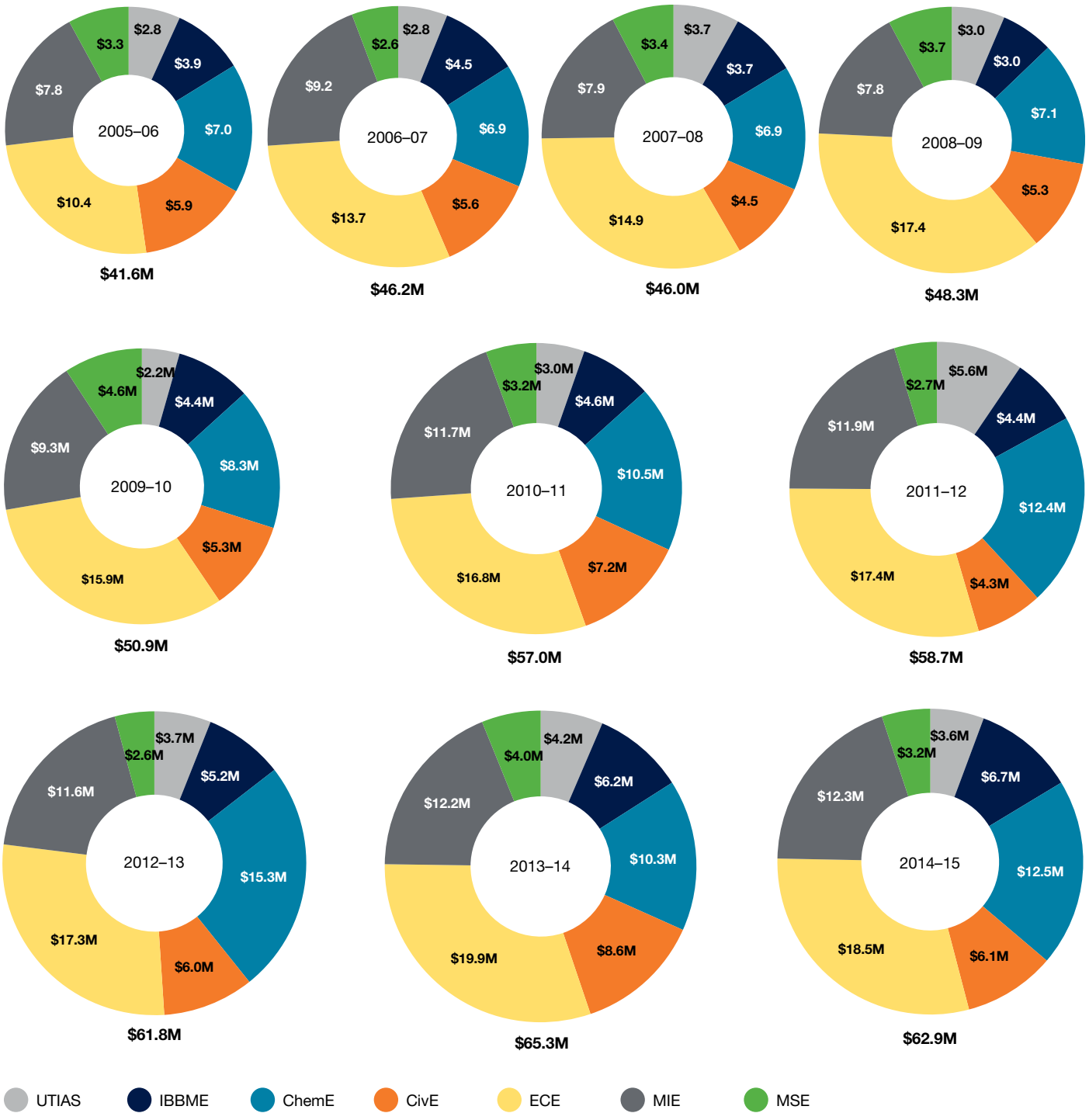


Figure 3.4c **U of T Patent Applications by Faculty, 2015–2016**

Figure 3.5 **Distribution of Research Operating Funding by Academic Area, 2005–2006 to 2014–2015**



Note 3.5: Totals include a small amount of additional funding not shown in the breakdown by academic areas. The research funding attributed to IBBME for 2014–15 represents 68 per cent of the total funding received by core professors in the Institute. Because of IBBME's cross-disciplinary structure, many of its faculty have their research funding processed through the Medicine or Dentistry Faculties. The figure above shows only the funding that comes through U of T Engineering and is presented by grant year (April to March).

4

Cross-Faculty Education and Experiential Learning

U of T Engineering fosters the next generation of makers, creators and innovators by integrating unparalleled experiential and collaborative learning opportunities throughout our curricular and co-curricular programs. We equip our students with the technical, professional and entrepreneurial competencies to excel in a complex global environment.

Our diverse minors and certificates in subjects ranging from sustainable energy to engineering business enable undergraduates to customize their degrees and collaborate with students in other disciplines based on shared interests. Interest in our minors and certificates continues to grow and this year for the first time, more than half of the graduating class has completed at least one minor or certificate.

We embed engineering design, communication skills, teamwork and leadership in all years of our undergraduate curriculum. First-year design courses and fourth-year disciplinary and multidisciplinary capstone projects give students opportunities to work in teams on challenges brought by industry clients. The Engineering Communication Program enhances students' professional communication competencies through both standalone courses and integration with core curriculum, and the Institute for Leadership Education in Engineering (ILead) offers electives that students can apply to undergraduate minors or to the MEng Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) emphasis.

Our Professional Experience Year (PEY) internship program, the largest optional paid internship of its kind in Canada, gives undergraduates the opportunity to immerse themselves in engineering practice for 12 to 16 months. PEY internships enable students to apply what they have learned in their studies while strengthening their professional networks and career paths.

A rich suite of co-curricular activities also enables students to enhance and broaden their competencies. Our two in-house incubators, The Entrepreneurship Hatchery and Start@UTIAS, provide mentoring and resources to help students take their ideas from concept to startup. Several ILead co-curricular programs encourage students to explore and hone their leadership competencies and maximize their impact as engineers. Our students can choose from more than 80 clubs and teams to pursue their passions while fostering the tightly knit community for which U of T Engineering is known.

Undergraduate Engineering Minors and Certificates, Complementary Courses and Inter-Divisional Collaboration

We offer diverse minors and certificates that enable undergraduates to customize their degrees, complement their chosen engineering programs and collaborate with students in other disciplines based on shared interests. Programs include technical options such as minors in Nanoengineering and Robotics & Mechatronics, and multidisciplinary programs such as the Minor in Sustainable Energy and the Certificate in Global Engineering. We also offer a range of opportunities for students to hone their professional competencies in areas such as engineering business, engineering leadership and communication.

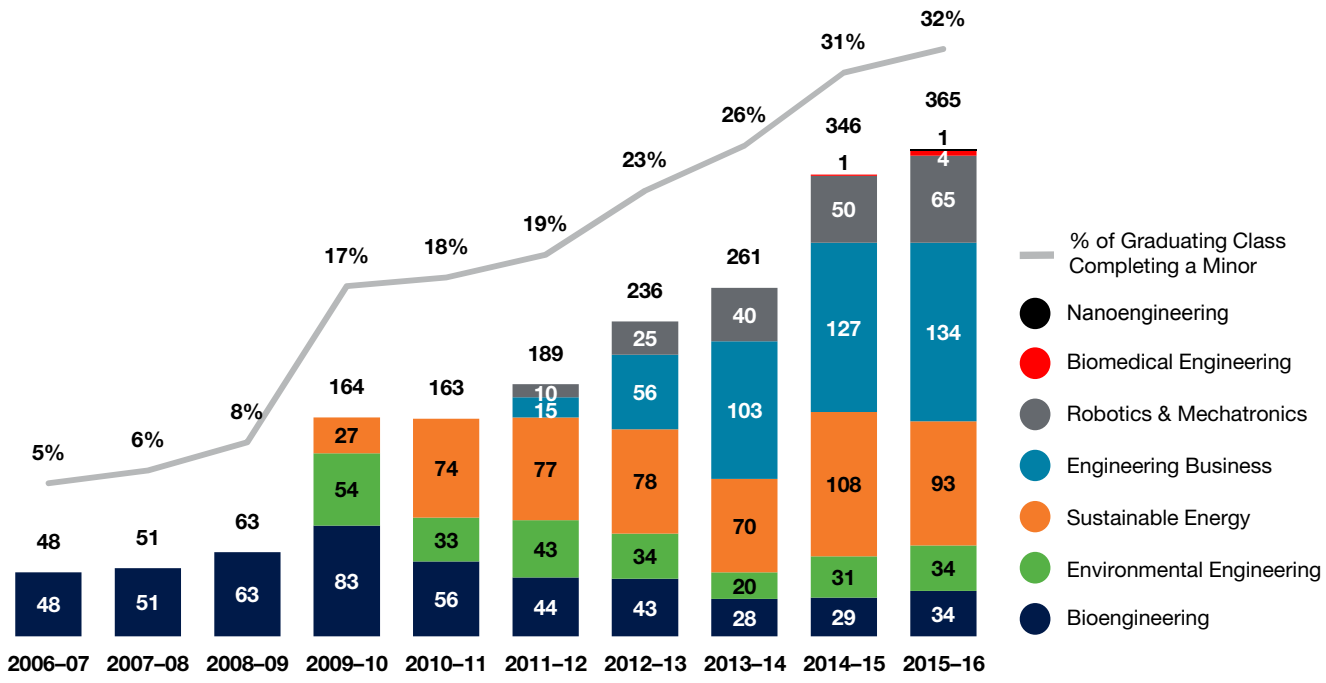
In 2015–2016, we offered the following minors and certificates:

Minors
- Bioengineering
- Biomedical Engineering
- Engineering Business
- Environmental Engineering
- Nanoengineering (new in 2015)
- Robotics & Mechatronics
- Sustainable Energy

Certificates
- Communication (new in 2015)
- Engineering Business
- Engineering Leadership
- Entrepreneurship, Innovation & Small Business
- Global Engineering
- Mineral Resources
- Nuclear Engineering
- Renewable Resources Engineering

Students must complete six half courses to earn a minor, and three half courses for a certificate. We have raised the proportion of graduating undergraduate students who complete a minor from five per cent 10 years ago to nearly a third today. This year, for the first time more than half of the graduating class completed at least one minor or certificate. The Engineering Business minor and certificate have been particularly popular, with more than a third of students completing one or the other (Figure 4.1b).

Figure 4.1a **Number of Students and Percentage of Graduating Class Completing an Engineering Minor, 2006–2007 to 2015–2016**



Data and highlights in this chapter are presented for the period from August 2015 to July 2016.

Engineering students may also complete minors through the Faculty of Arts & Science in areas such as economics, sociology, languages, cinema studies, philosophy, history and music.

As part of the Faculty's strategy to broaden students' competencies and prepare them for leadership, in 2015–2016 we added four complementary studies courses through ILead:

- APS 343 Foundations of Engineering Leadership
- APS 444 Positive Psychology for Engineers
- APS 445 The Power of Story
- APS 446 Leadership in Project Management

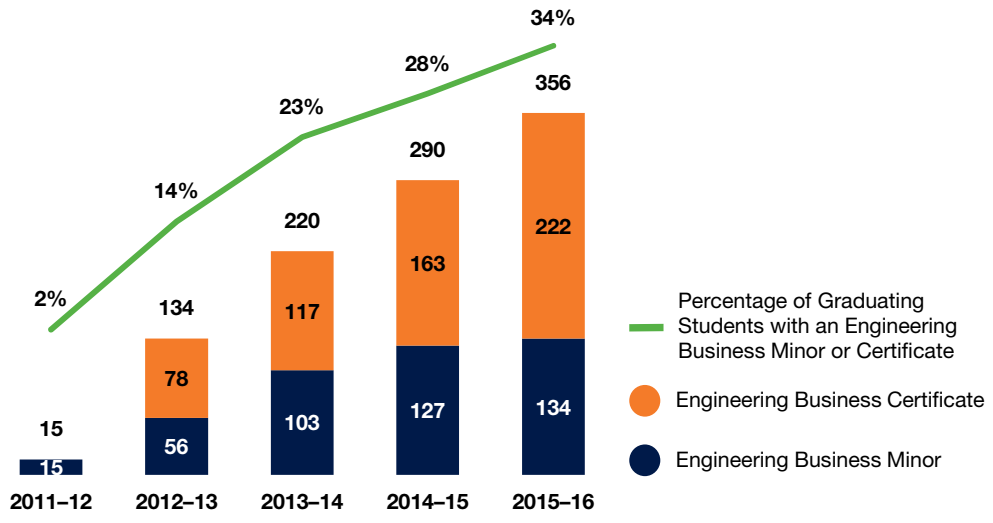
In 2016–2017, we will launch an additional course, APS 447 The Art of Ethical and Equitable Decision-Making.

We also introduced a new complementary studies elective — APS 120 Interdisciplinary Introduction to Sustainability — through the University Transition and Preparation Program (UT Prep). UT Prep is an eight-week summer preparatory program for students who have been admitted to U of T. The new course can be counted toward the Minor in Sustainable Energy.

Engineering Science students can customize their degrees by choosing from eight different majors in subjects from aerospace engineering to engineering physics. Our newest major in robotics engineering — launched in September 2015 — draws on expertise from electrical and computer engineering, computer science, mechanical engineering and aerospace studies, and was designed with a focus on perception, reasoning and acting as the three key functions of intelligent robots. Enrolment for 2016 has nearly doubled to 65 incoming third-year students.

We collaborate closely with other Faculties to broaden course options available to engineering students and to capitalize on research strengths across the University. In 2015, we signed an Interdivisional Teaching Agreement with the Faculty of Arts & Science that enables our Faculties to work together more effectively and guarantees a number of non-technical elective course slots for engineering students. We also strengthened interdisciplinary ties with the School of the Environment and the Department of Geography & Planning to enhance our Environmental Engineering Minor.

Figure 4.1b **Students Graduating with an Engineering Business Minor or Certificate, 2011–2012 to 2015–2016**



Undergraduate Design and Research Experiences

We embed engineering design throughout our undergraduate curriculum, enabling students in all years to experience the process of meeting a challenge, developing a solution and building and testing prototypes. The Centre for Engineering Innovation & Entrepreneurship (CEIE), which will include a 500-seat interactive auditorium, design/meet rooms, and rapid prototyping and fabrication facilities, will enhance design work across our programs. *(For more information about the CEIE, please see the introductory section of this report.)*

All undergraduates participate in engineering design courses in their first year. Engineering Science students take ESC 101 and 102 Praxis, and students in our General First Year and core programs take APS 111 and 112 Engineering Strategies and Practice. In both sets of courses, students learn the design process by addressing challenges proposed by industry and other clients while developing their competencies in teamwork, leadership and effective communication.

In 2015–2016, Praxis students were challenged to improve daily life in communities around the Greater Toronto Area. Designs presented in April 2016 at the Praxis showcase included:

- an accessible art station for children with fine-motor and cognitive delays;
- a mobile app that improves public engagement with the Allan Gardens Conservatory in downtown Toronto with a map to aid navigation and a virtual tour to help identify plants; and
- an improved drying system for rental skates at the Nathan Phillips Square skating rink outside Toronto's City Hall.

In their final year, all engineering students take on design challenges proposed by industry, other clients or themselves in capstone courses. Students may take discipline-specific capstone courses, including some that have an international focus. *(For more information, see Chapter 9: International Initiatives).*

Alternatively, they may enrol in APS 490 Multidisciplinary Capstone Project (MCP), which brings together undergraduate students from across the Faculty to work with leading companies and develop solutions to industry-proposed design challenges. Since the University of Toronto Institute for Multidisciplinary Design & Innovation (UT-IMDI) began offering the MCP course in 2012, 240 students from across all undergraduate programs have participated. In 2015–2016, 19 student teams worked with industry clients such as Astronauts for Hire, Bombardier, Defence Research & Development Canada, the Royal Bank of Canada and Sunnybrook Health Sciences Centre. Projects presented at the annual MCP Showcase in March 2016 included an inexpensive, portable accessibility lift, microgravity experiments to improve astronaut training and student education, and a modernized approach to teaching land navigation courses in the Canadian Armed Forces.

MCP designs from previous years continue to make an impact. Xposure, an app that helps firefighters track hazards they come in contact with on the job, began in 2014–2015's MCP course as a project for the Hamilton Professional Firefighters Association. More than 50 Hamilton firefighters are now using the app, which was originally designed for iPhones and is now available for Android phones.

The Innovation, Hammers & Nails Initiative gives students at the Institute of Biomaterials & Biomedical Engineering (IBBME) the opportunity to design engineering solutions to challenges identified by clinicians, nurses, staff and fellows at the Hospital for Sick Children. Launched in fall 2015, this initiative is available to undergraduate and graduate students through a range of courses and degree programs, including BME 498 Biomedical Engineering Capstone Design and the MHSc clinical internship. Projects included a 3D-printed eye for ophthalmology training and a wearable device to detect tripping hazards for elderly patients.

Undergraduates across all years have rich opportunities to engage in research that advances the frontiers of engineering, both within the Faculty and internationally. Through the Engineering Science Research Opportunities Program (ESROP), first- and second-year Engineering Science students work with faculty members each summer on research-based collaborations, exposing them early in their studies to the research process. Undergraduates across all programs who spent their summers working in laboratories at U of T Engineering presented their findings in August 2016 at the Undergraduate Engineering Research Day (UnERD). This annual event featured more than 100 poster and podium presentations on topics such as improving alternative energy production and preventing the formation of secondary organic aerosols, air pollutants that can cause health problems and impact climate change.

U of T Engineering students also have opportunities to conduct research abroad through programs administered by U of T's Centre for International Experience. Partner institutions include the National University of Singapore, Hong Kong University of Science & Technology and University of Stuttgart. Students in some programs have the option to receive degree credit for such exchanges through APS 299Y Summer Research Abroad. Engineering Science students who find their own research opportunities overseas can apply for an Exceptional Opportunities Award, which helps cover some of the costs associated with the placement. In 2015, students who received this

award conducted research at the Massachusetts Institute of Technology, Harvard University, the University of Michigan and the University of California, Berkeley, as well as the German Aerospace Center and the Aldebaran AI Lab. *(For more information on international opportunities for students, please see Chapter 9: International Initiatives.)*

Figure 4.2a **Undergraduate Participation in Summer Research Opportunities, 2010 to 2016**

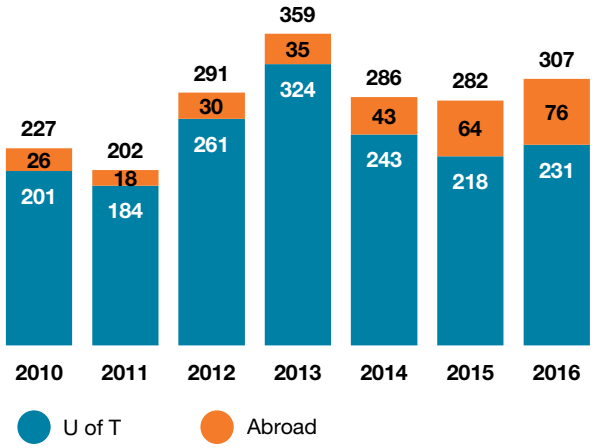


Figure 4.2b **Undergraduate Participation in Summer Research Opportunities, by Academic Area, 2016**

Research Participation:	U of T	Abroad	Total
ChemE	35	20	55
CivE & MinE	31	5	36
ECE	36	7	43
EngSci	70	38	108
MIE	38	5	43
MSE	16	1	17
Other (Non-Degree)	5	0	5
Total	231	76	307

Engineering Leadership

ILead provides transformative learning opportunities that prepare students to maximize their impact as engineers, innovators and leaders. In addition to curricular and co-curricular opportunities for students, ILead also conducts academic and industry-focused research and outreach to engineering leadership educators and engineering-intensive enterprises.

ILead offered five undergraduate and five graduate courses in 2015–2016, in areas ranging from leadership in project management to positive psychology for engineers. Our newest courses include:

- The Science of Emotional Intelligence and its Application to Leadership
- Engineering Careers – Theories and Strategies to Manage your Career for the Future

MEng students can count these courses toward the Entrepreneurship, Leadership, Innovation & Technology (ELITE) certificate, while undergraduate students can earn credits toward the Minor in Engineering Business or the Certificate in Engineering Leadership. Demand for these courses was strong; overall enrolment reached 512 students and many courses had significant waiting lists.

Engineering students also have opportunities to hone their leadership competencies in innovative co-curricular programs offered by ILead:

- Leadership Labs are highly experiential workshops ranging from evening sessions on project management, team conflict, public speaking, team culture, emotional intelligence and feedback to full-day labs on team skills and workplace readiness. In 2015–2016, ILead offered 25 co-curricular labs, and also delivered 17 labs as part of core courses. Students who attend four Leadership Labs are eligible for recognition on their Co-Curricular Records. Leadership Labs also provided work experience for five students, who were trained as co-facilitators.
- The Game challenges student teams to hone their leadership competencies by developing solutions to large-scale social problems. The program, which begins in September and culminates in a project showcase in March, attracted nine teams in 2015–2016. The $5,000 top prize went to a team that developed an app to reduce food waste. A strategy to promote urban gardening took second prize, while a campaign against social media overuse came in third place.
- The ILead Summer Fellowship is a 16-week program for highly engaged engineering students who want to increase the impact of their student organization and their

leadership competencies. The program includes strategies for organizational development, peer learning and individual coaching.
- In summer 2016, ILead launched the Faculty-wide Summer Leadership Program. With the tagline 'Engineer Your Future', the eight-week course provides summer research students with opportunities to better understand their strengths and values, gain new perspectives on engineering and its impact on society, and be part of a vibrant and diverse community. It included field trips to the mechanical shops and subway control rooms of the Toronto Transit Commission (TTC) as well as a meeting with engineers from the City of Toronto.

Highlights from ILead's academic and industry-focused research in 2015–2016 include:

- The Engineering Leadership Project II, a three-year study of engineers in the workplace. Co-sponsored by six companies, the project asks questions such as: How do engineers lead? How do they learn to lead? How do they make the transition from school to work and from technical work to leadership work? Research results will inform curriculum in order to increase the workplace readiness of engineering students.
- The Team Effectiveness Learning System (TELS) is an online tool that enables students in large courses to get personalized feedback that can help them work more effectively in teams. Developed by Professor Patricia Sheridan (ILead) in work sponsored by the Higher Education Quality Council of Ontario, a plan for commercialization of TELS is being planned as a result of the tool's success at U of T and interest from other universities.
- Case studies to present ethical and equity dilemmas that are relevant to engineering students. New pedagogy will frame discussion for active learning in a recently approved new course titled "The Art of Ethical and Equitable Decision Making in Engineering," and in multiple other teaching opportunities.

Student Entrepreneurship

At U of T Engineering, we provide rich curricular and co-curricular opportunities for students to develop the technical and entrepreneurial competencies they need to take their ideas from concept to startup.

Curricular Programs

Undergraduates can complement their technical studies through our popular Engineering Business Minor or Certificate in Entrepreneurship, Innovation & Small Business. Through the Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) emphasis, MEng students can take courses that prepare them to lead in business and entrepreneurial activities.

Incubators

The Entrepreneurship Hatchery and Start@UTIAS, our two in-house incubators, provide mentoring, networking, seed funding and other resources to help our students develop and launch businesses. They also contribute to the larger ecosystem of entrepreneurship support across the University.

Start@UTIAS, established in 2014 with a $1-million donation from entrepreneur Francis Shen (EngSci 8T1, UTIAS MASc 8T3), provides UTIAS graduate students with mentoring, networking, seed funding and other resources to translate the knowledge and competencies they have gained through their education into successful startups. Student teams are selected in December, work through two grant processes in March and June and present their pitches in September. Six teams pitched their business ideas in September 2015: 101 Sense, Diem Pouch, Kepler Communications, MedChart, MedTek Devices and teaBot. Seven teams are part of the 2015–2016 cohort.

The Hatchery, which will become an integral part of the CEIE when it opens in 2017, has launched 37 startups since 2013 and accepted 53 teams in its 2015–2016 cohort. The Hatchery promotes entrepreneurship through three distinct stages. In the first phase, students can attend a speaker series, weekly ideas market and events such as the Accelerator Weekend and the Hackathon. In the second stage, student teams develop business plans and apply for admission, with successful teams shifting their focus to developing a minimum viable product over the summer. The third stage begins with Hatchery Demo Day in September, when teams pitch their startups to investors and the University of Toronto community. From this stage, the Hatchery feeds the wider entrepreneurial ecosystem by launching teams into other accelerators and incubator programs in the community.

In January 2016, the four top teams from 2015 Hatchery Demo Day — three of which also participated in Start@UTIAS — received more than $180,000 in grants from the

Ontario Centres of Excellence's SmartStart Seed Fund, which supports Ontario-based startups that are associated with campus-linked accelerators:

- **Diem Pouch** ($30,000) has created a Bluetooth-enabled "smart pouch" that helps women remember to take birth control pills. It is improving basic features before beginning small-scale production for user testing and feedback. The company includes Valentin Peretroukhin (EngSci 1T3, UTIAS PhD candidate), Eric Ma (EngSci 1T3, IBBME MASc candidate), Tony Zhang (EngSci 1T3, UTIAS MASc candidate), Simon Bromberg (EngSci 1T3, IBBME MASc candidate), Sandra Fiset (MHSc candidate) and Courtney Smith (MPH Epidemiology candidate).
- **Kepler Communications** ($30,000) aims to improve communication in space by using small data-transmission satellites to build a space-based communications network that allows other satellites to transmit or receive data even when they are not near a ground station. It was one of nine companies selected to participate in winter 2016 in Techstars Seattle, a three-month technology accelerator that connects startups with training, mentors and funding to grow the businesses. The company includes engineering students Mina Mitry (EngSci 1T2, UTIAS MASc 1T4), Jeffrey Osborne (UTIAS PhD candidate), Wen Chen Chong (EngSci 1T3) and Mark Michael (ECE PhD candidate).
- **MedChart** ($60,000) seeks to improve health care by centralizing patients' medical records from multiple health-care providers on a secure, cloud-accessible platform. In 2016, the company moved into space in the Banting & Best Centre for Innovation & Entrepreneurship, a U of T incubator, and partnered with the Techna Institute at the University Health Network. Founded by James Bateman (EngSci 1T3, ECE PhD candidate) and Derrick Chow (EngSci 1T3, UTIAS MASc candidate), it also secured an angel investment from Hero Ventures and expanded its team to seven people.
- **Telehex** ($60,000) makes an all-in-one tool for adjusting the hexagonal-shaped sockets on most standard bicycles. The telescoping instrument automatically selects the correct size, making bike repairs faster and simpler. The company, started by Peter Wen (Year 3 MechE) has launched a Kickstarter campaign, and is developing the technical design, manufacturing and branding to start selling the product on a larger scale.

Alumni from previous incubator cohorts continue to innovate their products and develop their businesses. PheedLoop, an event and conference feedback app that was one of the top student startups at the Hatchery's 2014 Demo Day, was a finalist at the #IMEXpitch Technology Startup Competition in Las Vegas in October 2015. PheedLoop has also worked with Microsoft to power the event technology for its North American annual general meeting.

Heffernan Commercialization Fellowship

We support graduate student entrepreneurs through Heffernan Commercialization Fellowships, which provide $17,000 per year for up to two years for MASc and PhD students or recent graduates to translate their research into working prototypes and bring their innovations to market. The fellowship, which was originally created in 1997 as the Heffernan/Co-Steel Innovation Post-Graduate Fellowship, was extended in 2013 with a gift of $2.5 million from Gerald Heffernan (MMS 4T3).

In 2015–2016, the Heffernan Commercialization Fellowship went to Robert Brooks (MIE PhD 1T5). His company, SensOR Medical, has developed a force-sensing skin for endoscopic tools that helps surgeons better gauge how much force they are applying to tissues, reducing surgical complications from minimally invasive surgery. The fellowship will allow the company to conduct beta testing and develop manufacturing methods. The SensOR team, which also includes Justin Wee (ElecE 1T3, IBBME PhD candidate) and is advised by Thomas Looi (EngSci 0T0, UTIAS MASc 0T2, MBA 0T9, IBBME PhD candidate), has received a Banting & Best Centre for Innovation & Entrepreneurship Collaboration Fellowship and joined the Hatchery's 2016 cohort.

The Next 36

The Next 36 is a non-profit organization that seeks to increase Canada's economic prosperity by fast-tracking the development of Canada's most talented young entrepreneurs. Four U of T Engineering students and alumni are among 38 young innovators chosen to be part of The Next 36's 2016 cohort.

Nishant Samantray (MechE 1T5) is working on a startup called Tandem, which provides an online tool that integrates directly into developers' work flow, allowing them to make changes to their colleagues' code base in real time. Tandem received support from The Entrepreneurship Hatchery as part of the 2015 cohort.

Matthew Mazzuca (EngSci 1T6) is working on Mend, an app designed to ease the process of medical diagnosis. Users answer a series of questions to determine a pre-diagnosis, and are then able to book an appointment with a doctor.

Ashis Ghosh (MechE 1T5 + PEY) and **Karim Koreitem** (CompE 1T5 + PEY) met in U of T Engineering's Multidisciplinary Capstone Design course and quickly discovered a passion for entrepreneurship. They are working together on a startup that will leverage machine learning to provide simple solutions to data-rich problems.

Professional Experience

U of T Engineering offers undergraduate students rich opportunities to enhance their technical and professional competencies and gain significant work experience before they graduate through summer and year-long internships.

The Professional Experience Year (PEY) paid internship program is a key part of our Faculty's commitment to experiential learning. Through this optional program, students can work for leading companies worldwide after their second or third years of study. During this period, which lasts 12 to 16 months, they are full-time employees, with a competitive salary to match. PEY internships allow students to gain greater insights into workplace operations and make larger contributions than in the shorter co-op placements that many engineering schools offer. More than 70 per cent of PEY students who secure internships return to their studies with confirmed or tentative job offers in hand after they graduate.

In 2015–2016, a record 790 undergraduates — including 64 per cent of students from the previous year's third-year class — participated in the PEY internship program. The number who secured international placements increased to 79, from 61 in 2014–2015, as more students seek global engineering experience. More than 300 employers hired PEY students, ranging from startups such as EventMobi to large multinational corporations such as Apple, Deloitte, IBM and Tesla Motors. The average annual salary for engineering PEY students in 2015 was $50,000, with individual salaries ranging as high as $104,000.

Students may also choose to participate in the Engineering Summer Internship Program (eSIP), a paid, four-month summer internship that is open to second- and third-year U of T Engineering undergraduates. Akin to a traditional co-op placement, the program provides students with work experience and prepares them to be competitive for future opportunities, including the PEY internship program. To enhance student success in the recruitment process, the program offers intensive and interactive development through a series of large- and small-group workshops and individual career counselling appointments. In summer 2016, 30 students secured eSIP opportunities with employers such as the Toronto Transit Commission, Geomechanica Inc., Amphenol Canada Corp., BlueCat, and Temporal Power Ltd.

The Engineering Career Centre provides workshops throughout the academic year to help PEY and eSIP students prepare their applications, succeed in job interviews and make a positive impact in the workplace.

Figure 4.3a **PEY Internship Placements for Engineering Undergraduates with Percentage Participation from Previous Third-Year Class, 2006–2007 to 2015–2016**

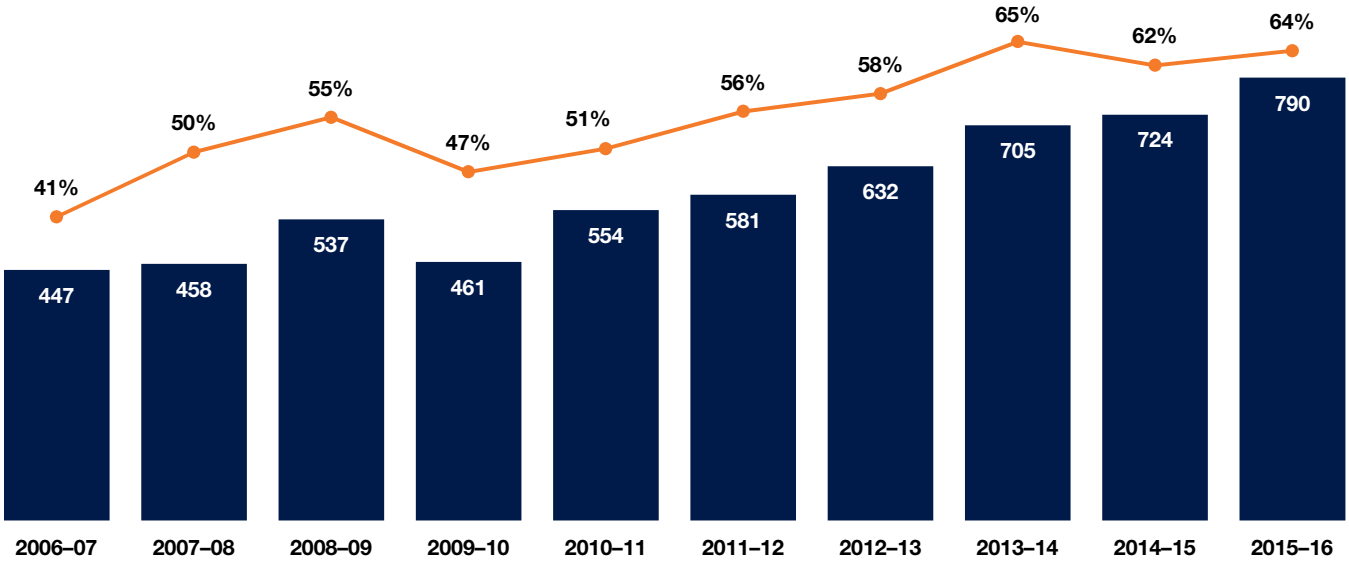


Figure 4.3b **Canadian and International PEY Internship Placements for Engineering Undergraduates, 2006–2007 to 2015–2016**

	Canadian Placements	U.S. Placements	Other International Placements	Total PEY Placements
2006–07	423	17	7	**447**
2007–08	427	23	8	**458**
2008–09	490	31	16	**537**
2009–10	426	24	11	**461**
2010–11	530	11	13	**554**
2011–12	547	26	8	**581**
2012–13	592	24	16	**632**
2013–14	644	36	25	**705**
2014–15	663	42	19	**724**
2015–16	711	50	29	**790**

Figure 4.3c **PEY Employers who Hired Engineering Students, 2009–2010 to 2015–2016**

	PEY Employers
2009–10	158
2010–11	185
2011–12	221
2012–13	241
2013–14	304
2014–15	317
2015–16	310

Engineering Communication

The Engineering Communication Program (ECP) is a leading hub for teaching, research and best practices in professional communication in engineering.

ECP is embedded in all years of our undergraduate programs, beginning with the first-year Praxis and Engineering Strategies and Practice courses. In upper years, ECP tailors its programs to the needs of each undergraduate program through standalone communication courses, portfolio classes and integration with the engineering design curriculum. It also coordinates the Certificate in Communication, which launched in 2015–2016 and graduated its first student in June 2016. The certificate leverages the suite of humanities and social sciences electives that have been offered by ECP faculty since 2008. In some departments, ECP faculty members train teaching assistants to give effective written and oral feedback, enhancing teaching excellence and the student experience.

ECP also offers individual tutoring to help undergraduates improve their writing and oral presentation skills in engineering courses, electives and other contexts such as job and graduate school applications. These tutoring sessions are held in person by appointment, during daily drop-in sessions or online. In 2015–2016, 833 students received communication support through this service.

ECP faculty members conduct research on engineering communication pedagogy and practice that enhances communication teaching throughout the Faculty and beyond. Areas of research include curriculum and program design, digital reusable learning objects, online teaching tools, information literacy and professional language development of multilingual students. In January 2016, ECP professor and founder Robert Irish published *Writing in Engineering: A Brief Guide,* which offers guidance on composing design reports, lab reports and other key engineering student assignments. To celebrate the program's 20th anniversary, ECP also hosted a speaker series featuring leading experts in engineering communication from across North America. Topics included communication in project teams, integrating social context into education and the role of early diagnostic assessments in academic success.

ECP, which includes five faculty members and more than 35 sessional lecturers, writing instructors and teaching assistants, also gives students opportunities to explore creative writing through a series of workshops on topics ranging from poetry and literary non-fiction to science fiction and board game design.

Student Clubs and Teams

Our students nurture their passions and interests through more than 80 U of T Engineering student clubs and teams, ranging from the Skule™ Orchestra to the Blue Sky Solar Racing team, as well as hundreds of student activities across U of T. Students can document these activities in the U of T Co-Curricular Record, an official document that recognizes competencies gained through athletic teams, student government, cultural clubs, design teams and other campus organizations.

In 2015–2016, 104 undergraduate and graduate engineering student initiatives received $249,266 through the Engineering Centralized Process for Student Initiative Funding. This process, which enables student groups to apply to various funding resources within the Faculty of Applied Science & Engineering in a single application, is widely seen among both funders and applicants as a significant improvement over past practices.

Please see Appendix A for a full list of student clubs and teams.

5

Our faculty members, staff and alumni continue to garner widespread recognition for outstanding achievements in research, teaching and community service. In 2015–2016, U of T Engineering received 21 per cent of major national and international awards won by engineering professors in this country — twice as many as any other Canadian school — with only 5.5 per cent of overall faculty members.

In the same period, U of T Engineering professors were recognized by their peers with distinguished awards from professional and technical societies. Dean Cristina Amon (MIE) received the Ontario Professional Engineers Awards Gold Medal, and Professor Andrew Goldenberg (MIE) received the A.G.L. McNaughton Gold Medal from the Institute of Electrical and Electronics Engineers Canada, both of which are the highest honours given out by the respective societies.

Early-career faculty members continued to win major international and national awards. Professor David Sinton (MIE) was inducted into the Royal Society of Canada College of New Scholars, Artists and Scientists in 2015 and received a 2016 NSERC Steacie Fellowship. Professor Warren Chan (IBBME) received the inaugural Kabiller Young Investigator Award from the International Institute for Nanotechnology. Professor Adam Steinberg (UTIAS) was the first recipient of the Hiroshi Tsuji Early Career Researcher Award.

Our faculty members continued to uphold their outstanding contributions to education. Professor Jonathan Rose (ECE) received the President's Teaching Award, the University of Toronto's highest award for teaching. Professor Greg Evans (ChemE) received an Ontario Confederation of University Faculty Associations Teaching Award. Professor Dawn Kilkenny (IBBME) garnered the Wighton Fellowship, a national award for excellence in laboratory teaching.

Senior faculty members garnered several highly distinguished awards. University Professor Molly Shoichet (ChemE, IBBME) was inducted into the U.S. National Academy of Engineering, one of two U of T professors who were among only four Canadians to be inducted in 2016. University Professor Ted Sargent (ECE) shared the prestigious NSERC Brockhouse Prize for Interdisciplinary Research. University Professor Michael Sefton (ChemE, IBBME) received the 2016 Terumo Global Science Prize, the first Canadian to receive this prize since its inception. Professor Elizabeth Edwards (ChemE) received a 2016 Killam Prize, among Canada's most distinguished research awards.

Staff members in several academic units were recognized for excellence in communications, design, events and publications by the Association of Marketing and Communication Professionals, the Council for Advancement and Support of Education and the International Association of Business Communicators.

Measuring Excellence

In the 2015 calendar year, U of T Engineering faculty members were recognized with 16 major awards and honours for excellence in research and teaching and contributions to the engineering profession. Fourteen of those awards were from prestigious national and international engineering bodies, twice as many as any other Canadian engineering school. That figure represented 21 per cent of all national and international awards received by engineering professors across Canada, even though our faculty members comprise only 5.5 per cent of engineering faculty members nationally.

Figure 5.1 Summary of Major International, National and Provincial Awards and Honours, 2006 to 2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
International										
AAAS Fellowships (Engineering Section)		2	4	4	6	5	3			1
MIT Top 35 Under 35			1				1			
U.S. National Academies*					1	1			1	
National										
3M Teaching Fellowship*		1								
Alan Blizzard Award		1							1	
Canadian Academy of Engineering Fellowships*	2	1	3	9	8	1	7	6	3	5
Engineering Institute of Canada Awards					1	2	1	2		1
Engineering Institute of Canada Fellowships	2	2	3	4	3	3	3	3	3	2
Engineers Canada Awards				1	3		1	1	1	1
Killam Prize*			1						1	
Killam Research Fellowships*			2		2					
Manning Innovation Award									1	
Royal Society of Canada Fellowships*	1	1	1	1	2	4	3		2	2
Royal Society of Canada College of New Scholars, Artists and Scientists									1	1
Steacie Fellowships*				1			2	1	1	1
Steacie Prize*							1			
Synergy Award for Innovation				1			1			
Provincial										
Ontario Professional Engineers Awards	1		3	4	4	5	3	2	2	1
OCUFA Teaching Award					1					1
Total	**6**	**8**	**18**	**25**	**31**	**21**	**26**	**15**	**17**	**16**

Data in this chapter are presented for the 2015 calendar year (January to December). Selected faculty, alumni and staff awards were received between summer 2015 and summer 2016.

Note 5.1: (*) denotes U of T performance indicator. Data shown are by calendar year (January to December) and include faculty award recipients only. Please see Appendix G to read descriptions of the listed awards and honours.

Figure 5.2a **Number of Major National and International Awards Received by U of T Engineering Compared to Other Canadian Engineering Faculties, 2015**

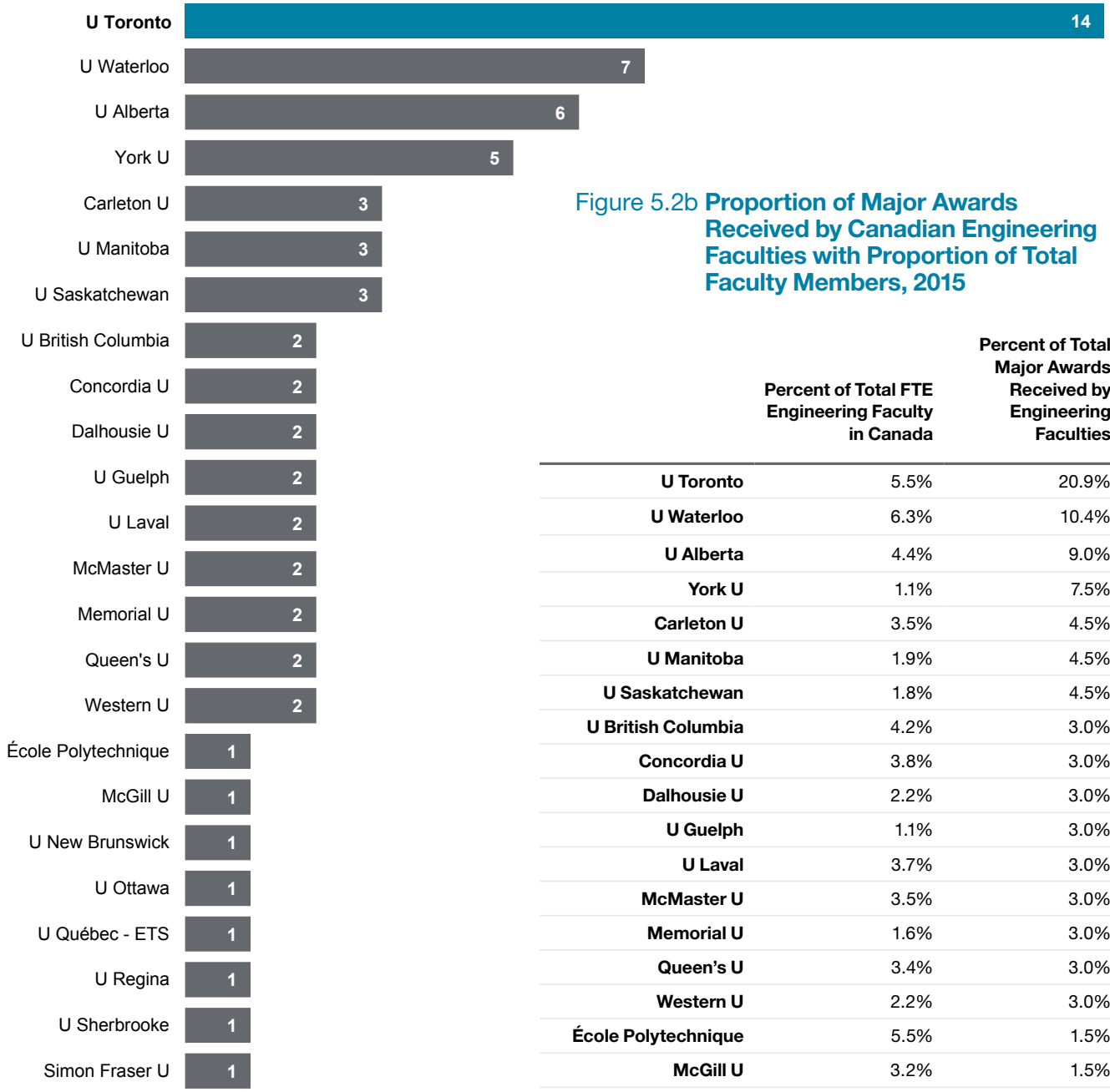
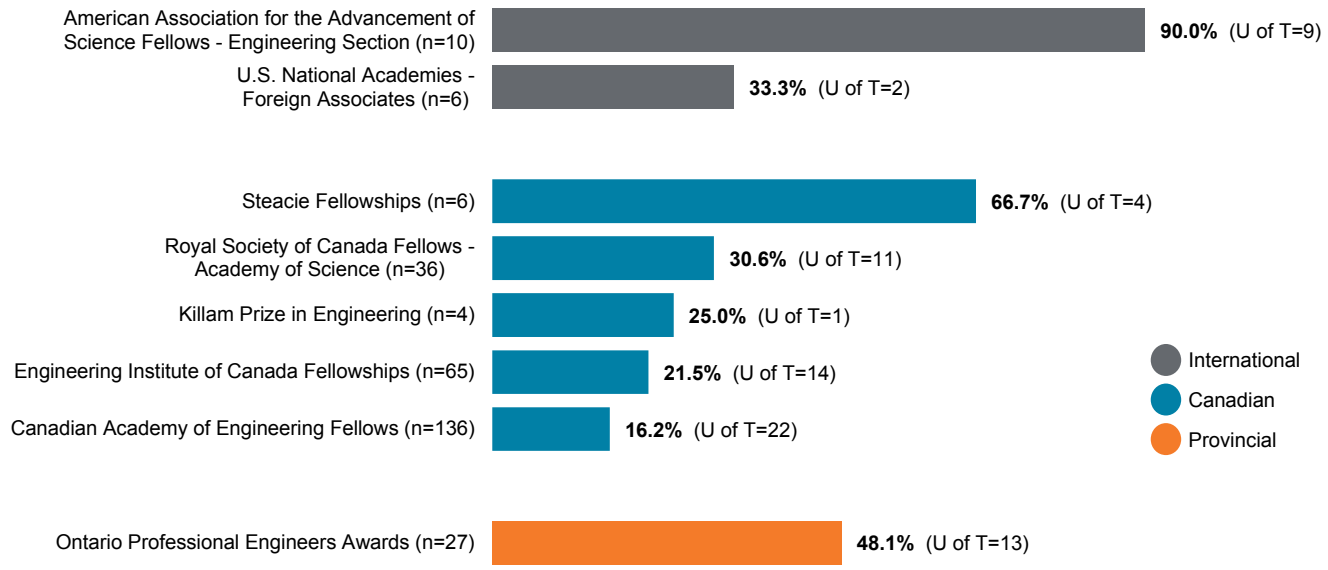


Figure 5.2b **Proportion of Major Awards Received by Canadian Engineering Faculties with Proportion of Total Faculty Members, 2015**

	Percent of Total FTE Engineering Faculty in Canada	Percent of Total Major Awards Received by Engineering Faculties
U Toronto	5.5%	20.9%
U Waterloo	6.3%	10.4%
U Alberta	4.4%	9.0%
York U	1.1%	7.5%
Carleton U	3.5%	4.5%
U Manitoba	1.9%	4.5%
U Saskatchewan	1.8%	4.5%
U British Columbia	4.2%	3.0%
Concordia U	3.8%	3.0%
Dalhousie U	2.2%	3.0%
U Guelph	1.1%	3.0%
U Laval	3.7%	3.0%
McMaster U	3.5%	3.0%
Memorial U	1.6%	3.0%
Queen's U	3.4%	3.0%
Western U	2.2%	3.0%
École Polytechnique	5.5%	1.5%
McGill U	3.2%	1.5%
U New Brunswick	1.6%	1.5%
U Ottawa	2.8%	1.5%
U Québec – ETS	7.9%	1.5%
U Regina	0.9%	1.5%
U Sherbrooke	5.0%	1.5%
Simon Fraser U	3.8%	1.5%

Note 5.2a and 5.2b: Data shown are by calendar year (January to December) and include faculty award recipients only. The following major awards are included: International — American Association for the Advancement of Science Fellowship (Engineering Section), MIT Top 35 under 35, U.S. National Academies; National — Alan Blizzard Award, Canadian Academy of Engineering Fellowship, Engineering Institute of Canada Award, Engineering Institute of Canada Fellowship, Engineers Canada Awards, Killam Prize (Engineering), Killam Research Fellowship, Manning Innovation Award, Royal Society of Canada Fellowship (Engineering/Physical Sciences), Royal Society of Canada College of New Scholars, Artists and Scientists, Steacie Fellowship, Steacie Prize and Synergy Awards for Innovation.

Figure 5.3 **Number of Awards Received by U of T Engineering Faculty Compared to Other Canadian Engineering Faculties, 2011 to 2015**



Selected Awards Received by Faculty Members and Alumni

The following is a selected list of awards U of T Engineering professors and alumni received between summer 2015 and summer 2016.

International

American Association for the Advancement of Science: *Fellow*
Greg Evans (ChemE)

American Concrete Institute: *Joe W. Kelly Award*
Frank Vecchio (CivE)

American Institute of Aeronautics and Astronautics: *Associate Fellow*
Kamran Behdinan (MIE)

American Society of Mechanical Engineers: *Fellow*
Kamran Behdinan (MIE)

Committee for the Status of Women in Computing Research: *Borg Early Career Award*
Natalie Enright Jerger (ECE)

The Combustion Institute and Elsevier: *Hiroshi Tsuji Early Career Researcher Award*
Adam Steinberg (UTIAS)

European Society for Biomaterials: *International Award*
Michael Sefton (ChemE, IBBME)

Institute for Operations Research and the Management Sciences: *Moving Spirit Award*
Dionne Aleman (MIE)

Institute of Electrical and Electronics Engineers: *Fellow*
Dimitrios Hatzinakos (ECE)

Institute of Electrical and Electronics Engineers: *Robotics and Automation Award*
Raffaello D'Andrea (EngSci 9T1)

Institute of Materials, Minerals and Mining: *Fellow*
Paul Young (CivE)

International Academy of Food Science and Technology: *Lifetime Achievement Award*
Levente Diosady (ChemE)

International Institute for Nanotechnology: *Kabiller Young Investigator Award*
Warren Chan (IBBME)

Nanocem Research Network: *George C. Hoff Award for Concrete Technology*
Doug Hooton (CivE)

National Academy of Engineering (U.S.): *Foreign Member*
Molly Shoichet (ChemE, IBBME)

Réunion Internationale des Laboratoires et Experts des Matériaux: *Fellow*
Doug Hooton (CivE)

Terumo Foundation for Life Sciences and Arts: *Terumo Global Science Prize*
Michael Sefton (ChemE, IBBME)

Note 5.3: Data shown are by calendar year (January to December) and include faculty award recipients only.

National

Canadian Academy of Engineering: *Fellows*
Nazir Kherani (ECE, MSE)
Deepa Kundur (ECE)
Milica Radisic (IBBME, ChemE)
Murray Thomson (MIE)
Honghi Tran (ChemE)
William Breukelman (ChemE 5T5)
Elizabeth Croft (MIE PhD 9T5)
Samantha Espley (GEO 8T8)
John Gruzleski (PhD MMS 6T8)
Georges Kipouros (MASc MMS 7T7, PhD 8T2)

Canadian Institute of Mining, Metallurgy and Petroleum: *Brimacombe Award*
Mansoor Barati (MSE)

Canadian Institute of Mining, Metallurgy and Petroleum: *Environmental Award*
Charles Jia (ChemE)

Canadian Society for Chemical Engineering: *Hatch Innovation Award*
Milica Radisic (IBBME, ChemE)

Canadian Society for Civil Engineering: *Fellow*
Jeff Packer (CivE)

Canadian Society for Civil Engineering: *Albert E. Berry Medal*
Robert Andrews (CivE)

Canadian Society for Civil Engineering: *Camille A. Dagenais Award*
Bryan Karney (CivE)

Canadian Society for Mechanical Engineering: *Fellow*
Lidan You (MIE)

Engineering Institute of Canada: *Fellow*
Kamran Behdinan (MIE)
Hugh Liu (UTIAS)
Heather MacLean (CivE)

Engineering Institute of Canada: *John B. Stirling Medal*
Marc Rosen (MechE 8T1, MASc 8T3, PhD 8T7)

Engineering Institute of Canada: *Julian C. Smith Medal*
Doug Hooton (CivE)

Engineers Canada: *Meritorious Service Award for Community Service*
Marisa Sterling (ChemE 9T1)

Institute of Electrical and Electronics Engineers Canada: *A.G.L. McNaughton Gold Medal*
Andrew Goldenberg (MIE)

Killam Prize
Elizabeth Edwards (ChemE)

March of Dimes Canada: *Jonas Salk Pioneer Award*
Tom Chau (IBBME)

NSERC: *Brockhouse Prize for Interdisciplinary Research*
Ted Sargent (ECE)

NSERC: *E.W.R. Steacie Fellowship*
David Sinton (MIE)

Royal Canadian Institute: *Fleming Medal and Citation*
Molly Shoichet (ChemE, IBBME)

Royal Society of Canada: *Fellow*
Levente Diosady (ChemE)
Brendan Frey (ECE)

Royal Society of Canada: *Member, College of New Scholars, Artists and Scientists*
David Sinton (MIE)

Sandford Fleming Foundation: *Wighton Fellowship*
Dawn Kilkenny (IBBME)

Women's Executive Network: *Canada's Most Powerful Women Top 100*
Siobhan Robinson (ChemE 0T9, MSE MASc 1T0)
Jeanette Southwood (ChemE 8T6, MASc 8T8)

Provincial

Ontario Professional Engineers Awards: *Gold Medal (2015)*
Cristina Amon (MIE)

Ontario Confederation of University Faculty Associations: *OCUFA Teaching Award*
Greg Evans (ChemE)

U of T

University Professor
Peter Zandstra (IBBME)

Distinguished Professor of Computational Aerodynamics and Sustainable Aviation
David Zingg (UTIAS)

Distinguished Professor of Mechanobiology
Craig Simmons (MIE, IBBME)

Distinguished Professor of Urban Systems Engineering
Mark Fox (MIE)

JJ Berry Smith Doctoral Supervision Award
David Zingg (UTIAS)

Massey College Senior Fellow
Grant Allen (ChemE)

President's Teaching Award
Jonathan Rose (ECE)

U of T Invention of the Year Award
Brendan Frey (ECE)

University Health Network Inventor of the Year Award
Milos Popovic (IBBME)

Selected Awards Received by Staff, April 2015 to April 2016

Association of Marketing & Communication Professionals

Hermes Creative Awards – Gold Winner:
Impact Magazine
Luke Ng (MSE)

Council for Advancement and Support of Education (CASE) District II (Middle Atlantic) Accolades Awards

Gold Award, Special Public Relations Projects Category: *"Say Yes to Engineering" Campaign*
Engineering Strategic Communications, Engineering Recruitment and Engineering Outreach

Silver Award, Special Event (Individual Events) Category: *CEIE Groundbreaking Event*
Engineering Strategic Communications and Engineering Advancement

International Association of Business Communicators

Gold Quill Excellence Award for Marketing, Advertising and Brand Communication:
CEIExSKAM — Centre for Engineering Innovation & Entrepreneurship Graffiti Installation
Engineering Strategic Communications and U of T Communications

Gold Quill Excellence Award for Publications:
2015 Annual Report of Performance Indicators
Engineering Strategic Communications and Office of the Dean

Gold Quill Merit Award for Marketing, Advertising and Brand Communications and Silver Leaf Award for Marketing Communication:
"Say Yes to U of T Engineering" Campaign
Engineering Strategic Communications, Engineering Student Recruitment & Retention and Engineering Student Outreach

Gold Quill Merit Award for Special Events and Silver Leaf Award for Special Events — External:
CEIE Groundbreaking Event
Engineering Strategic Communications, Engineering Advancement & Alumni Relations and U of T Advancement Communications

Not-for-Profit Communication Department of the Year
Engineering Strategic Communications and University of Toronto Communications

University of Toronto Engineering Faculty Awards

Each year, U of T Engineering recognizes the excellence of our staff and faculty through a number of awards for research, teaching, leadership and dedication to improving the student experience. This year's awards were presented at the Celebrating Engineering Excellence event held April 14, 2016.

Agnes Kaneko Citizenship Award

Presented to a staff member who has served with distinction and made contributions to the Faculty's mission above and beyond their job description over a long period of time. This award was established in memory of a dedicated Civil Engineering staff member.

2015–16: Matthew Chow (ECE)
2014–15: Belinda Li (ECE)
2013–14: Oscar del Rio (MIE)
2012–13: Mary Stathopoulos (ECE)

Harpreet Dhariwal Emerging Leader Award

Presented to a staff member who leads by example in their dedication to the Faculty's mission. Recipients are held in high regard by colleagues and demonstrate potential to assume more senior leadership roles within the Faculty. This award was renamed in memory of an esteemed staff member who received this honour in 2011–2012.

2015–16: Bruno Korst (ECE)
2014–15: Kelly Hayward (ECE)
2013–14: Luke Ng (MSE)
2012–13: Tom Nault (Office of the Registrar)

Influential Leader Award

Presented to a staff member who demonstrates exemplary support for the Faculty's education and research endeavours. Recipients inspire others to realize their potential through their significant and sustained contributions.

2015–16: Leslie Grife (First Year Office)
2014–15: Joe Baptista (MIE)
2013–14: Lisa Camilleri (Office of the Dean)
2012–13: Sandra Walker (IBBME)

Innovation Award

Presented to staff who, individually or as a team, address a problem creatively by developing a new technology or making significant improvements to an existing system or method.

2015–16: Roberta Baker, Raymond Cheah, Shilpa Gantotti and Catherine Riddell (Engineering Strategic Communications)
2014–15: Darlene Gorzo, Jaro Pristupa and Joe Wong (ECE)
2013–14: Tomas Bernreiter (MIE)
2012–13: Khuong Doan, Adam Fox, Linda Marsh, Sergei Metropolitansky and Dan Pettigrew (Office of the Registrar)

McCharles Prize for Distinction in Early Career Research

The McCharles Prize was originally established in 1907 by Aeneas McCharles through a gift to the Faculty of Applied Science & Engineering at the University of Toronto. In 2007, the Faculty and the University re-established the McCharles Prize as an award for exceptional performance and distinction in early career research, typically on the part of a pre-tenure member of the Faculty of Applied Science & Engineering.

2015–16: Adam Steinberg (UTIAS)
2012–13: Joyce Poon (ECE)
2009–10: Craig Simmons (MIE, IBBME)
2007–08: Wei Yu (ECE)

Quality of Student Experience Award

Presented to a staff member who has made significant improvements to the quality of student experience.

2015–16: Carla Baptista (MIE)
2014–15: Mike Mehramiz (ECE)
2013–14: Susan Grant (ECE)
2012–13: Deborah Peart (ChemE, MIE)

Research Leader Award

Presented to a faculty member or team who has shown leadership in innovative, interdisciplinary and/or collaborative research initiatives that has enhanced the Faculty's research profile within the broader community.

2015–16: Alberto Leon-Garcia (ECE)
2014–15: Honghi Tran (ChemE)
2013–14: Javad Mostaghimi (MIE)
2012–13: Elizabeth Edwards, Radhakrishnan Mahadevan and Emma Master (ChemE)

Engineering Alumni Association Awards

The Engineering Alumni Association's annual awards honour graduates for outstanding contributions to U of T Engineering and to the profession. This year's awards will be conferred in November 2016.

L.E. (Ted) Jones Award of Distinction

Inspired by the contributions of Professor Emeritus L.E. (Ted) Jones, this award honours an alumnus/alumna for his or her support and dedication to U of T Engineering and its arts community.

2015–16: Xiao Fionna Gan (EngSci 1T6)
2014–15: Luca Casciato (MechE 1T5); Haruna Monri (CivE 1T5)
2013–14: Christopher Sun (EngSci 1T3 + PEY)
2012–13: Ryan Alafriz (IndE 1T2 + PEY); Thineshan Kathirchelvan (EngSci 1T2 + PEY)

7T6 Early Career Award

Presented to an alumnus/alumna 10 years after graduation who is distinguished in the profession and community.

2015–16: Gimmy Chu (ElecE 0T6)
2014–15: Stefanie Blain-Moraes (EngSci 0T5); Todd Reichert (EngSci 0T5)
2013–14: Mathew Szeto (CompE 0T4)
2012–13: Terrence Michael Branch (CompE 0T3)

2T5 Mid-Career Achievement Award

Presented to an alumnus/alumna 25 years after graduation who has earned respect within the profession and broader community, attained significant achievement and exhibits promise of further contributions.

2015–16: Raffaello D'Andrea (EngSci 9T1)
2014–15: Janet Elliot (EngSci 9T0); Suneet Tuli (CivE 9T0)
2013–14: Ted Maulucci (MechE 8T9)
2012–13: Samantha Espley (MinE 8T8)

Malcolm F. McGrath Alumni Achievement Award

Named in honour of Malcolm McGrath on his retirement as assistant dean, alumni liaison, this award recognizes contributions of personal service to the Faculty, University or to the greater community.

2015–16: Ross Pitman (GeoE 7T4)
2014–15: R. Christopher Hinde (CivE 5T0)
2013–14: Caprice Boisvert (MechE 9T3)
2012–13: Claire Kennedy (ChemE 8T9)

Engineering Alumni Hall of Distinction Award

The Hall of Distinction is an assembly of extraordinary alumni, selected by their peers for their lifelong accomplishments. These are graduates who have ultimately defined what is most exemplary in the engineering profession.

2015–16:
Paul Henderson (EngBus 5T7)
Ali Khademhosseini (ChemE 9T9, IBBME MASc 0T1)
Ronald Sidon (IndE 6T6)
John Weber (MechE 7T9)

2014–15:
William Breukelman (ChemE 5T5)
Jan Carr (ElecE 6T8)
Jay Cross (EngSci 7T5)
Emil Frind (CivE 6T6)

2013–14:
Prabha Kundur (ElecE MASc 6T5, ECE PhD 6T7)
Gerald Smith (MechE 8T7)
Som Seif (IndE 9T9)
William Troost (ChemE 6T7)

2012–13:
Anthony Lacavera (CompE 9T7)
Lee Lau (ElecE 7T7, ECE MEng 8T2)
Donald Sadoway (EngSci 7T2, MSE MASc 7T3, MSE PhD 7T7)
David Wilkinson (EngSci 7T2, MSE MASc 7T4)
Anna Dunets Wills (CivE 7T6)

Engineering Alumni Medal

As the Engineering Alumni Association's highest honour, this award is presented to an alumnus/alumna who has demonstrated superior accomplishment and serves as an outstanding role model for students.

2015–16: David Colcleugh (ChemE 5T9, MASc 6T0, PhD 6T2)
2014–15: Frank Dottori (ChemE 6T3)
2013–14: Arthur Slutsky (EngSci 7T0, MIE MASc 7T2)
2012–13: Paul Cadario (CivE 7T3)

Honorary Member – Engineering Alumni Association

2015: Ronald D. Venter (MIE)

6

World Recognition by Rankings

We evaluate our excellence by diverse factors, including the exceptional calibre of applicants to our programs, growing recognition of our world-class research, and the large number of prestigious awards and honours our faculty receive. In a competitive global environment for higher education, rankings are another indicator of distinction. The international visibility resulting from our outstanding rankings enables us to attract top students, faculty and industry collaborators, strengthening our position as a leader in engineering education and research.

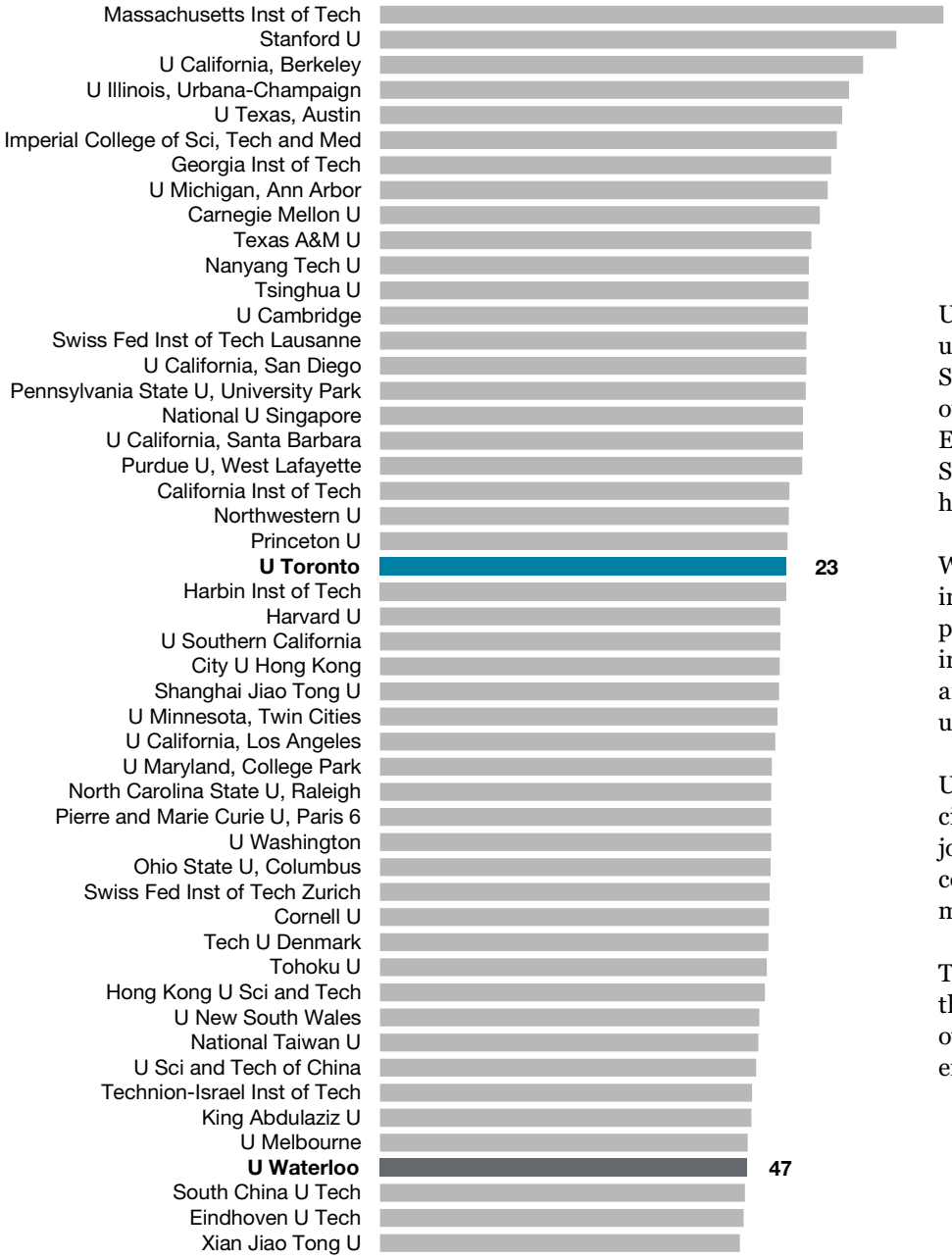
Our Faculty is the leading Canadian engineering school and among the best in the world across all international rankings. In 2015, U of T was the only Canadian university to rank in the top 25 schools globally in the Shanghai Jiao Tong Academic Ranking of World Universities (ARWU) for Engineering/Technology and Computer Sciences, and the Times Higher Education (THE)–Elsevier World University Ranking for Engineering and Information Technology. It was also the sole Canadian school in the top 50 in the QS World University Rankings for Engineering and Information Technology (QS) and the National Taiwan University (NTU) Performance Ranking of Engineering Papers. U of T Engineering distinguished itself as a North American leader by placing among the top 10 public universities — our closest peer institutions — in three of four rankings.

Subject rankings once again recognized the breadth and depth of our excellence. U of T Engineering placed first among Canadian universities in five out of six subjects in the QS ranking, and in four out of six subjects in the NTU, demonstrating our pre-eminence across diverse engineering fields.

Comprehensive University Rankings

Shanghai Jiao Tong Academic Ranking of World Universities (ARWU) for Engineering/Technology and Computer Sciences

Figure 6.1a **ARWU Top 50 World Universities, 2015**



U of T ranked among the premier universities worldwide in the 2015 Shanghai Jiao Tong Academic Ranking of World Universities (ARWU) for Engineering/Technology and Computer Science, advancing to 23rd globally, the highest of any Canadian university.

We were also the only Canadian school in the top 25. Among North American public universities, our closest peer institutions, U of T ranked 11th, and was one of only two Canadian universities in the top 25.

U of T led Canadian schools in highly cited research and articles in top journals, two of three indicators that constitute the ARWU's evaluation methodology.

The ARWU is the longest running of the global rankings. It has provided overall rankings since 2003 and engineering field rankings since 2007.

Data in this chapter include rankings published between August 2015 and July 2016.

Figure 6.1b **ARWU Top North American Public Universities, 2015**

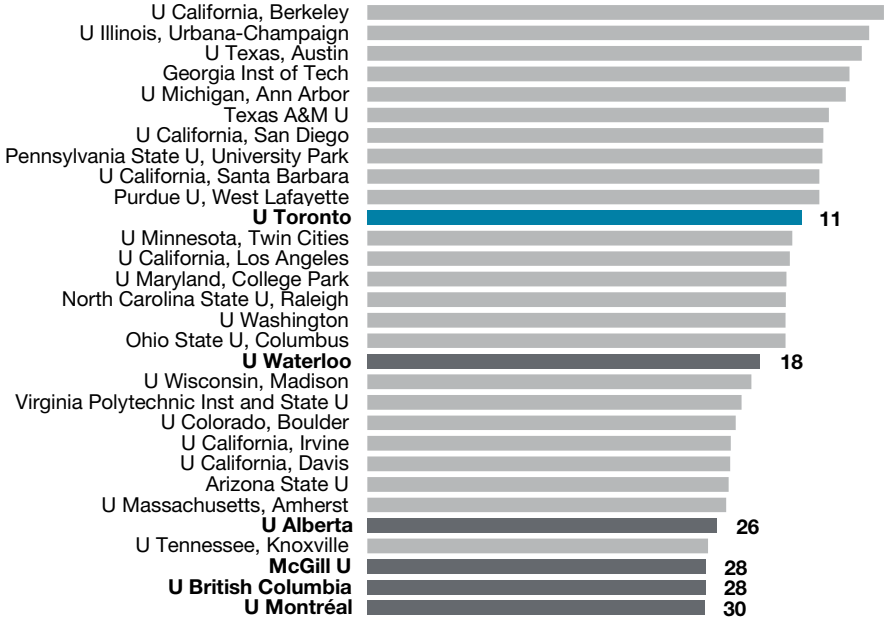
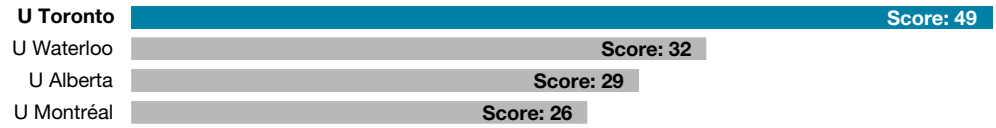


Figure 6.1c **Canadian U15 Universities in ARWU Top 200, 2015**

Figure 6.1d **Scoring Analysis of Canadian U15 Universities in ARWU Top 100, 2015**

Scoring on Highly Cited Research: (HiCi) Indicator



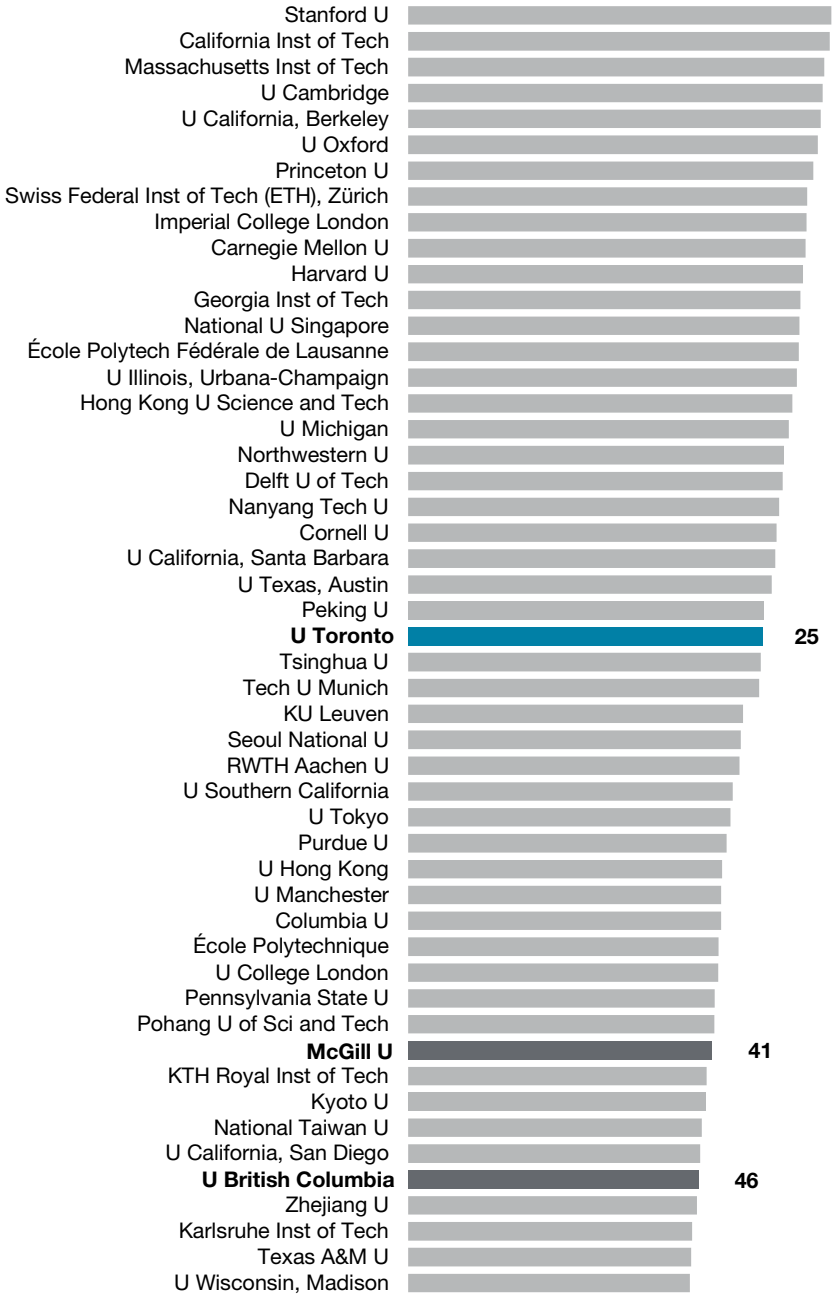
Scoring on Published Articles: (PUB) Indicator

Scoring on Articles in Top Journals: (TOP) Indicator

Note 6.1d: In addition to HiCi, Pub and TOP, the ARWU uses a fourth indicator called Research Expenditures (FUND), which is used only for U.S. schools. Research funding mechanisms differ so significantly from country to country that all other international universities, including Canadian universities, are ranked using only the first three indicators.

Times Higher Education (THE)–Elsevier World University Ranking for Engineering and Information Technology

Figure 6.2a **THE Top 50 World Universities, 2015**



U of T was the top Canadian university in the Times Higher Education (THE)–Elsevier World University Ranking for Engineering and Information Technology, placing 25th overall and seventh among North American public universities. Only two other Canadian schools — McGill University and the University of British Columbia — placed among the top 50 universities in the world for these subjects.

THE is the second-longest running survey of its kind after the ARWU. What sets THE apart as an influential assessment of global, research-intensive universities is the breadth of its evaluation, which aims to measure institutions across all their core missions: teaching, research, knowledge transfer and international outlook. The THE ranking uses 13 performance indicators in five weighted categories:

- Teaching: the learning environment (30 per cent)
- Research: volume, income and reputation (30 per cent)
- Citations: research influence (30 per cent)
- International outlook: staff, students and research (7.5 per cent)
- Industry income and innovation (2.5 per cent)

Figure 6.2b **THE Top North American Public Universities, 2015**

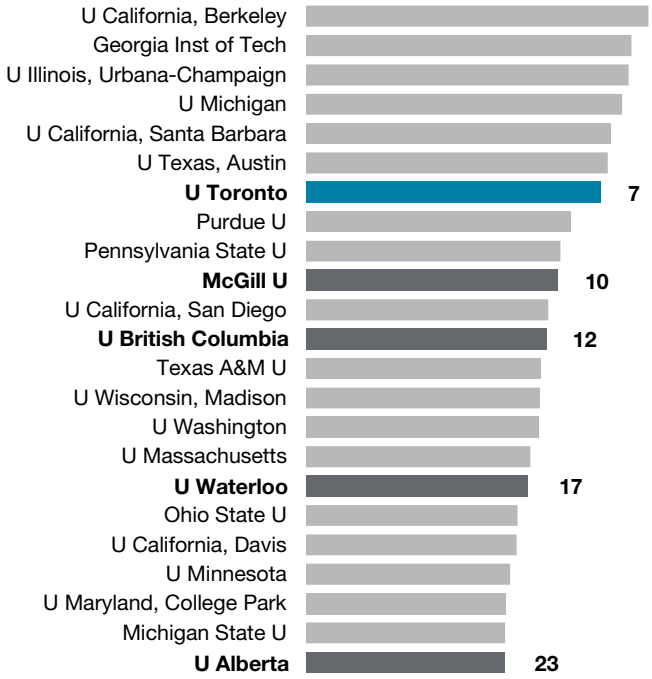


Figure 6.2c **Canadian U15 Universities in THE Top 100, 2015**

QS World University Rankings for Engineering and Information Technology

Figure 6.3a **QS World University Rankings, Top 50 Universities for Engineering and Information Technology, 2015**

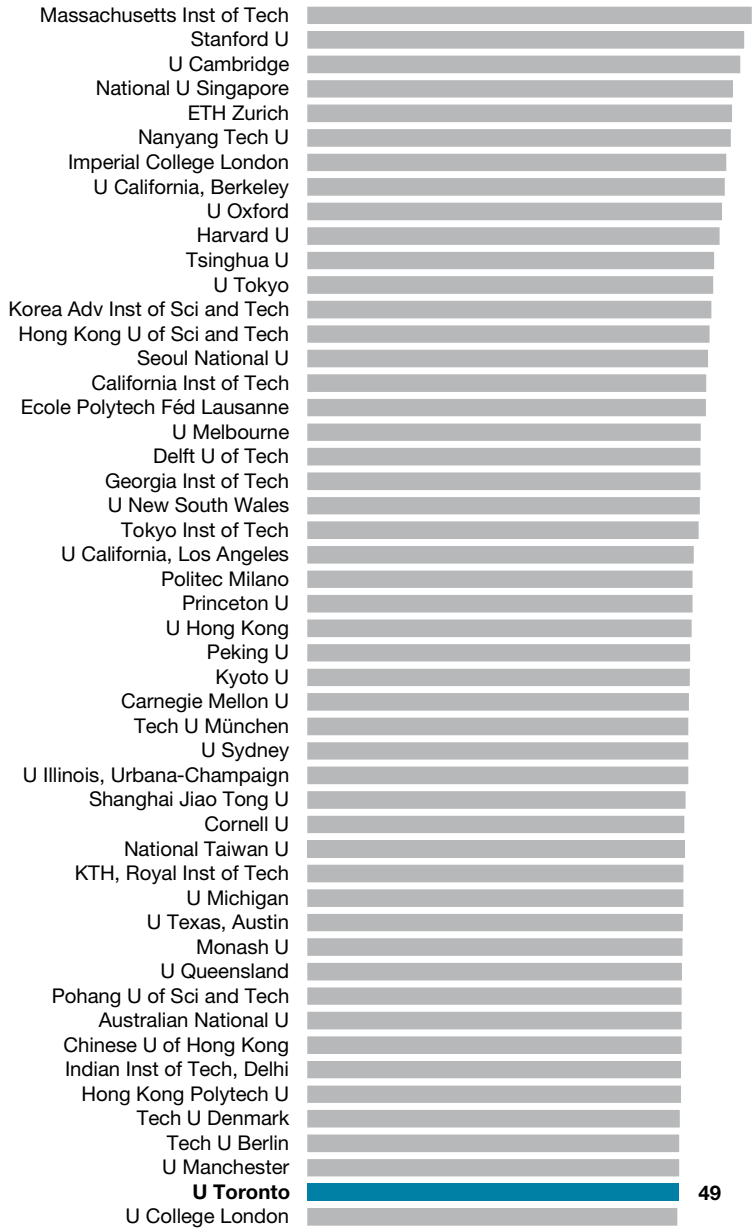


Figure 6.3b **QS World University Rankings, Top North American Public Universities for Engineering and Information Technology, 2015**

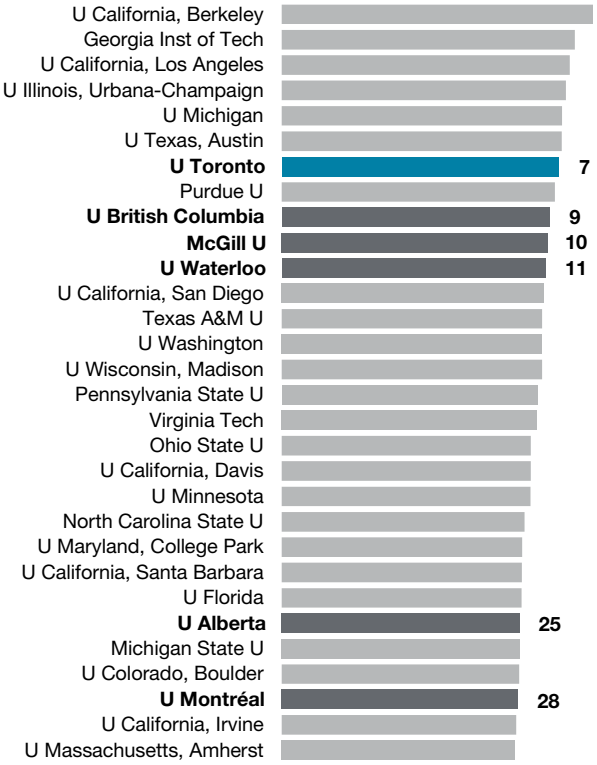
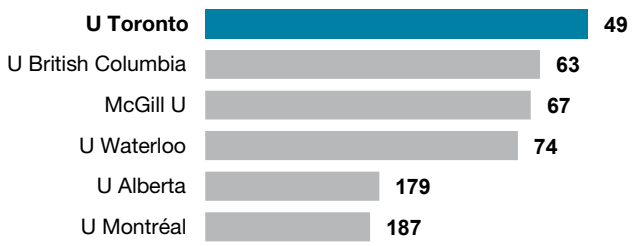


Figure 6.3c **Canadian U15 in Top 200 from QS World University Rankings for Engineering and Information Technology, 2015**

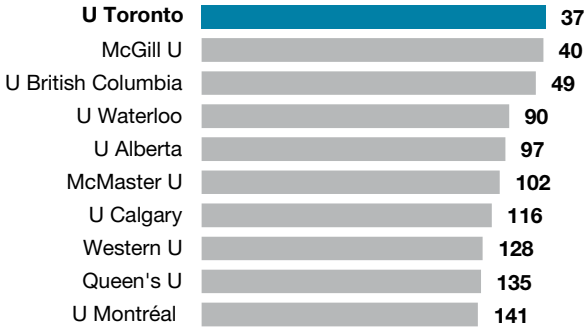


U of T Engineering, once again, outperformed all other Canadian universities in the QS World University Rankings for Engineering and Information Technology and was the only Canadian school in the top 50. We were also recognized as one of the premier North American public universities, placing seventh among these peer institutions. U of T ranked the highest of any Canadian engineering school in five out of six engineering and information technology subjects, demonstrating our broad strength.

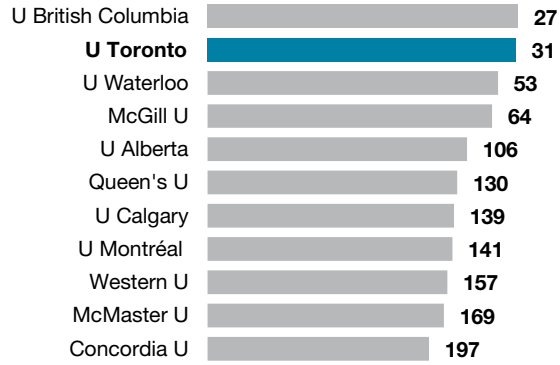
Despite our position in the QS ranking, U of T Engineering, like all Canadian U15 engineering schools in the top 200 globally, experienced volatility in the rankings. Several U15 schools that had placed within the top 200 in 2014 fell below this threshold in 2015. Nearly all of the top engineering programs at North American public universities also dropped in the global rankings, but within this subset there was a high degree of stability relative to one another. The subject-level rankings also remained stable year-over-year, especially among North American peer institutions.

Figure 6.3d **Canadian Universities in QS by Subject, 2016**

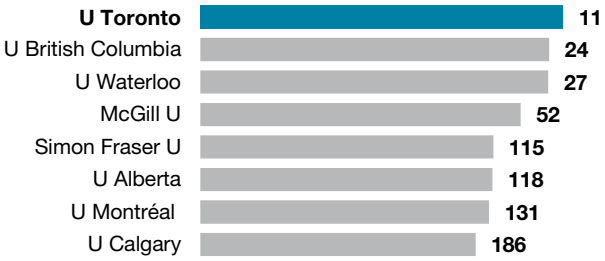
Chemical Engineering



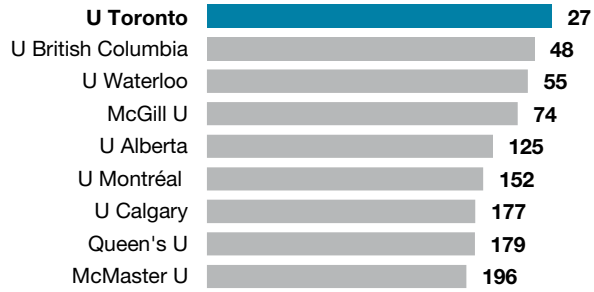
Civil & Structural Engineering



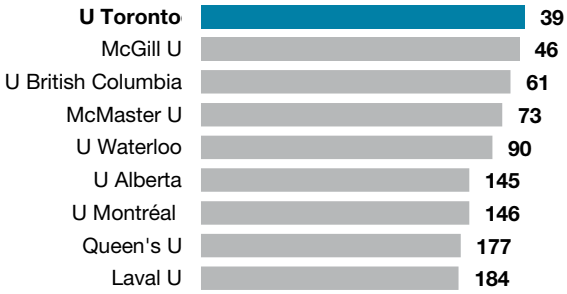
Computer Science & Information Systems



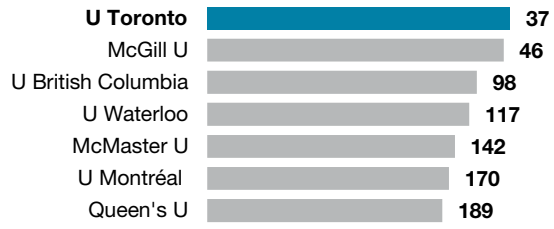
Electrical & Electronic Engineering



Materials Sciences



Mechanical, Aeronautical & Manufacturing Engineering



While QS has not communicated any changes in methodology in its Faculty-level rankings, the volatility noted above suggests a modification that may have had a regional impact. It is unclear if this has any relation to the major changes QS implemented in its 2015 ranking methodology that sought to both balance citation performance across all disciplines and adjust for regional variations globally. The changes negatively impacted the overall rankings of research-intensive universities with strengths in life sciences and medicine, including all Canadian universities of this type.

Although the QS Subject Rankings are dated 2016 and are announced in March, six months after the September release of the University and Field Rankings, they are based on the same data as the rankings shown above in Figures 6.3a through 6.3c. For further information about the methodological changes QS implemented in 2015, please see www.iu.qs.com/2015/09/methodology-refinements-explanations-by-martin-ince/.

National Taiwan University (NTU) Performance Ranking of Engineering Papers

U of T Engineering ranked 39th globally and first in Canada in the National Taiwan University Performance Ranking of Engineering Papers. It also placed in the top tier of North American public universities, in eighth place.

NTU uses the publication of engineering papers to identify and compare the top 200 universities in the world by subject. NTU's ranking is based on eight weighted criteria grouped into three broad categories:

Research Productivity

- Total number of articles published in the past 11 years (2004–14) [10 per cent]
- Total number of articles published in the most recent year reported (2014) [15 per cent]

Research Impact

- Total number of citations in the past 11 years (2004–14) [15 per cent]
- Total number of citations in the past two years (2013–14) [10 per cent]
- Average annual number of citations over the past 11 years (2004–14) [10 per cent]

Research Excellence

- H-index (measures productivity and impact of published work) of the past two years (2013–14) [10 per cent]
- Number of highly cited papers in the past 11 years (2004–14) [15 per cent]
- Number of papers published in high-impact journals in the current year (2014) [15 per cent]

Figure 6.4a **NTU Top 50 World Universities, 2015**

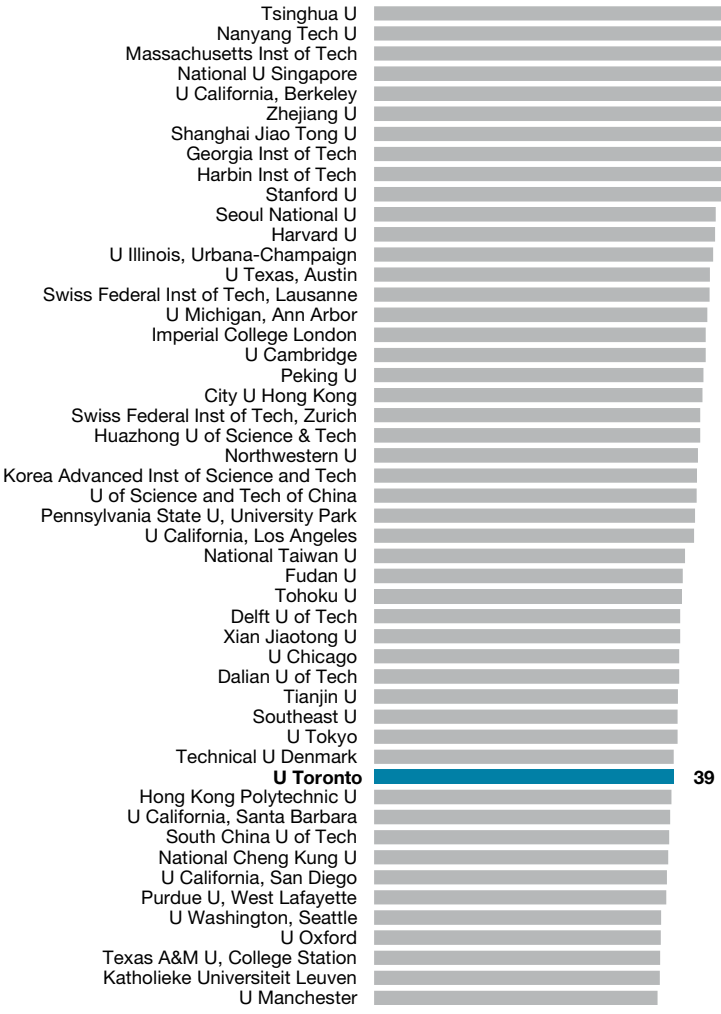
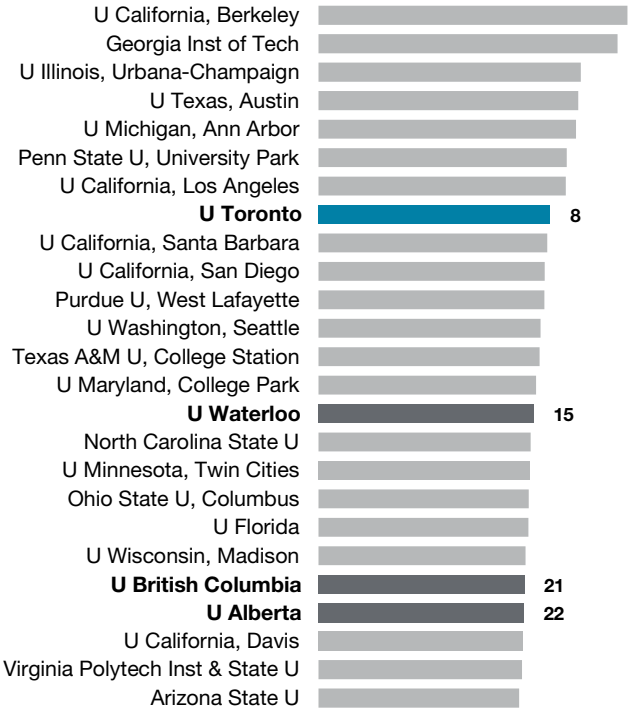


Figure 6.4b **NTU Top North American Public Universities, 2015**



U of T Engineering placed first among Canadian institutions in four out of six subjects in NTU's rankings of engineering and information technology subject areas. U of T's Civil and Electrical Engineering programs were particularly strong, respectively ranking 23rd and 26th globally.

Figure 6.4c **Canadian U15 Universities in NTU Top 200, 2015**

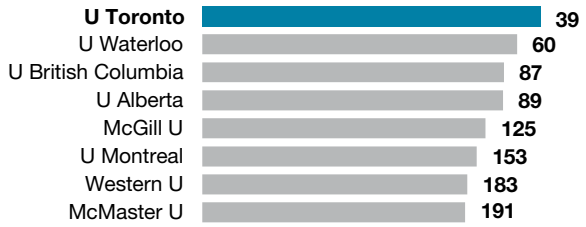
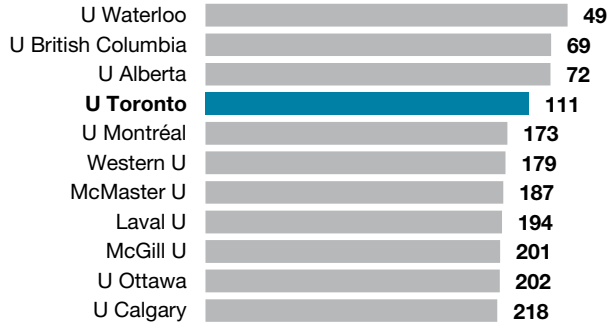
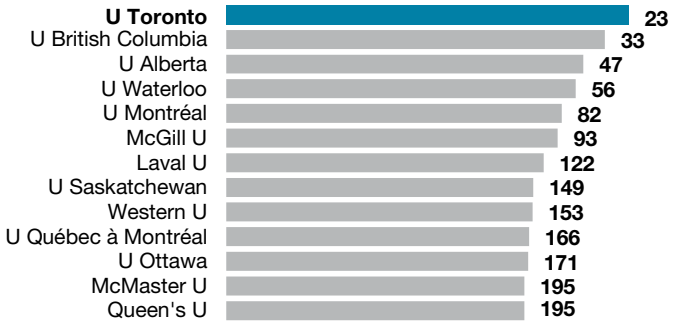


Figure 6.4d **Canadian Universities in NTU by Subject, 2015**

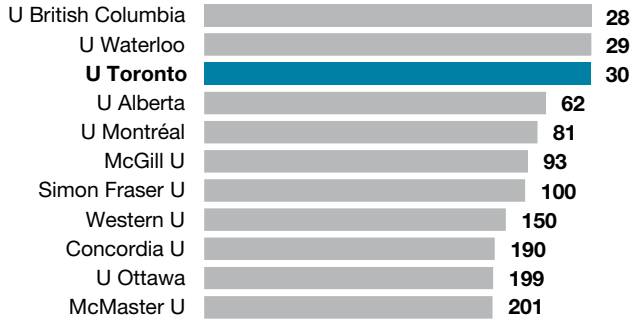
Chemical Engineering



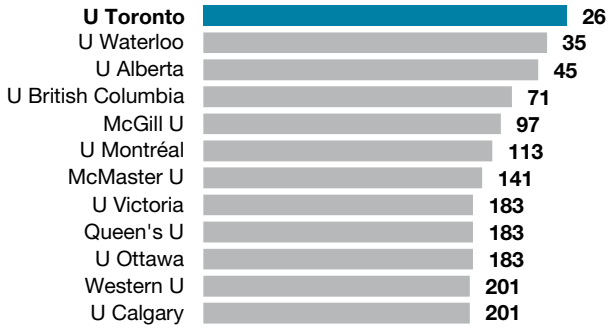
Civil Engineering



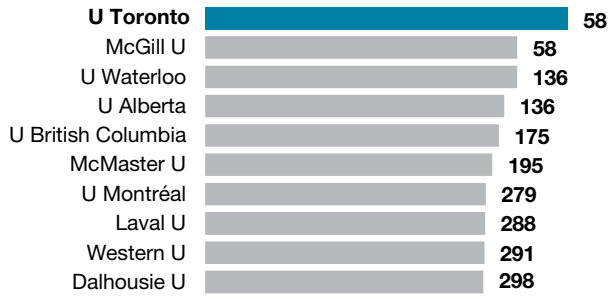
Computer Science



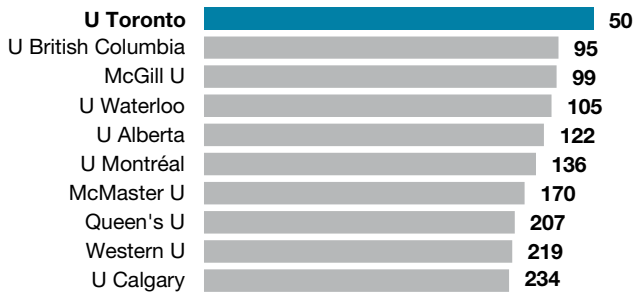
Electrical Engineering



Materials Science



Mechanical Engineering



Rankings Based on Publications and Citations

Figure 6.5a **Number of Engineering Publications Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2010 to 2014**

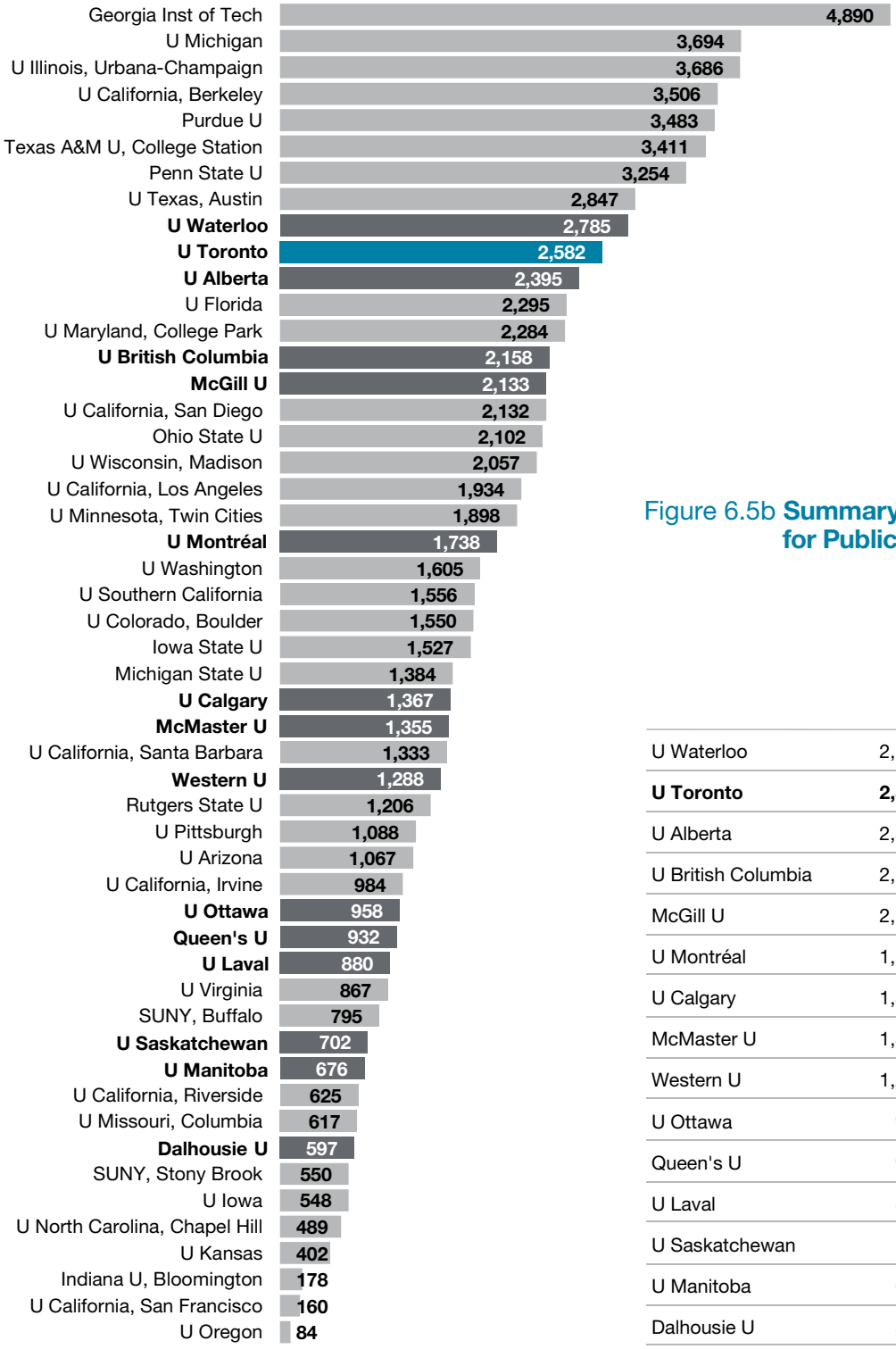


Figure 6.5b **Summary of U15 Bibliometrics for Publications**

	Publications	Faculty Count	Publications per Faculty	Rank on Pub per Faculty
U Waterloo	2,785	276	10.1	6
U Toronto	**2,582**	**242**	**10.7**	**5**
U Alberta	2,395	191	12.5	3
U British Columbia	2,158	184	11.8	4
McGill U	2,133	140	15.2	1
U Montréal	1,738	241	7.2	12
U Calgary	1,367	156	8.8	9
McMaster U	1,355	154	8.8	8
Western U	1,288	95	13.6	2
U Ottawa	958	121	7.9	11
Queen's U	932	149	6.3	13
U Laval	880	162	5.4	15
U Saskatchewan	702	78	9.0	7
U Manitoba	676	82	8.2	10
Dalhousie U	597	97	6.2	14

Note 6.5 and 6.6: Faculty counts are based on data from the Engineers Canada 2014 Resources Report Publication and citation data from Thomson Reuters InCities™, updated June 13, 2016.

Figure 6.6a **Number of Engineering Citations Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2010 to 2014**

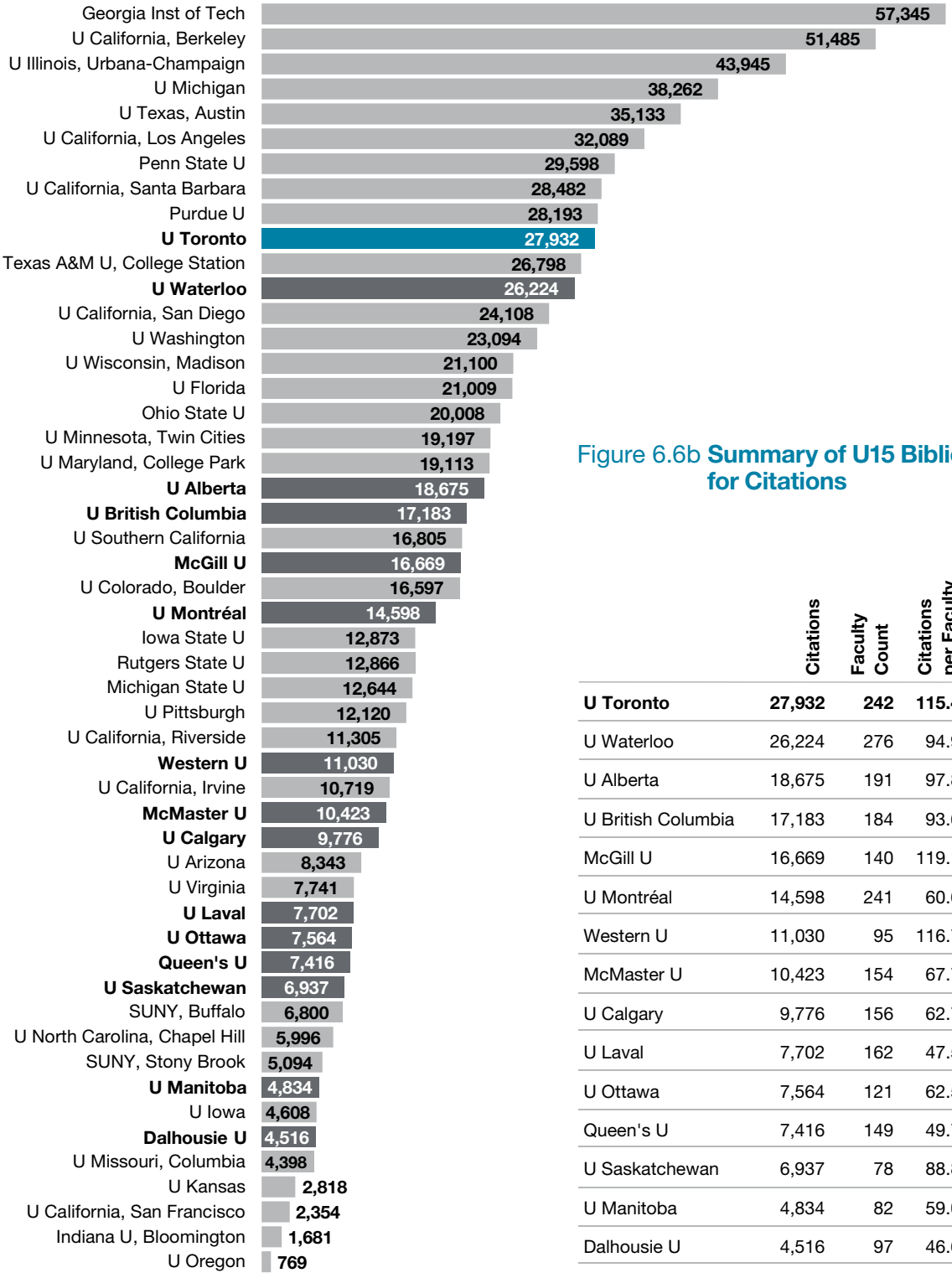


Figure 6.6b **Summary of U15 Bibliometrics for Citations**

	Citations	Faculty Count	Citations per Faculty	Rank on Citations per Faculty	Citations per Publication	Rank on Citations per Publication
U Toronto	**27,932**	**242**	**115.4**	**3**	**10.8**	**1**
U Waterloo	26,224	276	94.9	5	9.4	3
U Alberta	18,675	191	97.8	4	7.8	11
U British Columbia	17,183	184	93.6	6	8.0	7
McGill U	16,669	140	119.1	1	7.8	10
U Montréal	14,598	241	60.6	11	8.4	6
Western U	11,030	95	116.7	2	8.6	5
McMaster U	10,423	154	67.7	8	7.7	12
U Calgary	9,776	156	62.7	9	7.2	14
U Laval	7,702	162	47.5	14	8.8	4
U Ottawa	7,564	121	62.5	10	7.9	9
Queen's U	7,416	149	49.7	13	8.0	8
U Saskatchewan	6,937	78	88.8	7	9.9	2
U Manitoba	4,834	82	59.0	12	7.2	15
Dalhousie U	4,516	97	46.6	15	7.6	13

Summary of Ranking Results

U of T is the premier Canadian engineering school across all global rankings in 2015, and the only Canadian school in the top 25 in both the ARWU and THE. Among North American public universities, we ranked in the top 10 in three of the four ranking systems. Although no ranking can decisively illustrate a school's performance, our world-class rankings enhance our ability to attract top faculty, researchers and students from around the world.

Figure 6.7 **Summary of University of Toronto Engineering Performance in World Rankings**

Ranking Organization	Release Date	Canada	North American Public	World
Academic Ranking of World Universities for Engineering (ARWU) for Engineering / Technology and Computer Sciences	August 2015	1	11	23
ARWU Scoring Detail by Category	August 2015			
– Highly Cited (HiCi)		1	12	23
– Publications (PUB)		2	10	61
– Publications in Top Journals (TOP)		1	16	61
Times Higher Education (THE)–Elsevier World University Ranking for Engineering & Technology	October 2015	1	7	25
QS World University Rankings for Engineering and Technology	September 2015	1	7	49
QS World University Rankings by Subject	March 2016			
– Chemical Engineering		1	16	37
– Civil & Structural Engineering		2	9	31
– Electrical & Electronic Engineering		1	12	27
– Materials Science		1	16	39
– Mechanical, Aeronautical & Manufacturing Engineering		1	14	37
– Computer Science & Information Systems		1	7	11
National Taiwan University (NTU) Performance Ranking of Scientific Papers for World Universities by Subject	October 2015	1	8	39
NTU Performance Ranking by Subject	October 2015			
– Chemical Engineering		4	20	111
– Civil Engineering		1	7	23
– Electrical Engineering		1	8	26
– Materials Science		1	10	58
– Mechanical Engineering		1	12	50
– Computer Science		3	11	30

7

The philanthropic contributions of our global alumni community enable us to advance our research, enhance the student experience and strengthen our facilities. Many alumni volunteer their time to give guest lectures, contribute to advisory boards or mentor student startups, benefitting current students with access to their vast experience. Others provide gifts to support research, student activities or new infrastructure.

This year, generous donations by alumni enabled us to create new development opportunities for our early-career professors, as well as graduate and undergraduate students. With a transformational bequest from the estate of Erwin Edward Hart, we created the Percy Edward Hart and Erwin Edward Hart Professorships, which will support researchers in the first 10 years of their careers, as well as their graduate students.

In total, we attracted $29.3 million in gifts through 2015–2016. This brings our fundraising for Boundless: The Campaign for the University of Toronto to $180 million, which is 90 per cent of our $200 million goal. The Centre for Engineering Innovation & Entrepreneurship (CEIE), a cornerstone of our Boundless campaign, received a $15 million investment from the Ontario government as part of its innovation strategy in February 2016. When it opens in 2017, the CEIE will enable us to set a new standard for engineering education and research. We look forward to celebrating the half-way point of construction in fall 2016.

We continued our robust alumni engagement activities through regional events such as BizSkule, held in Toronto, Calgary and California's Silicon Valley, as well as the Alumni Mentorship Program and a communications campaign to promote volunteerism. We also enhanced our online engagement with alumni by rolling out Graduway, a powerful alumni social media platform, across several departments.

Philanthropic Support

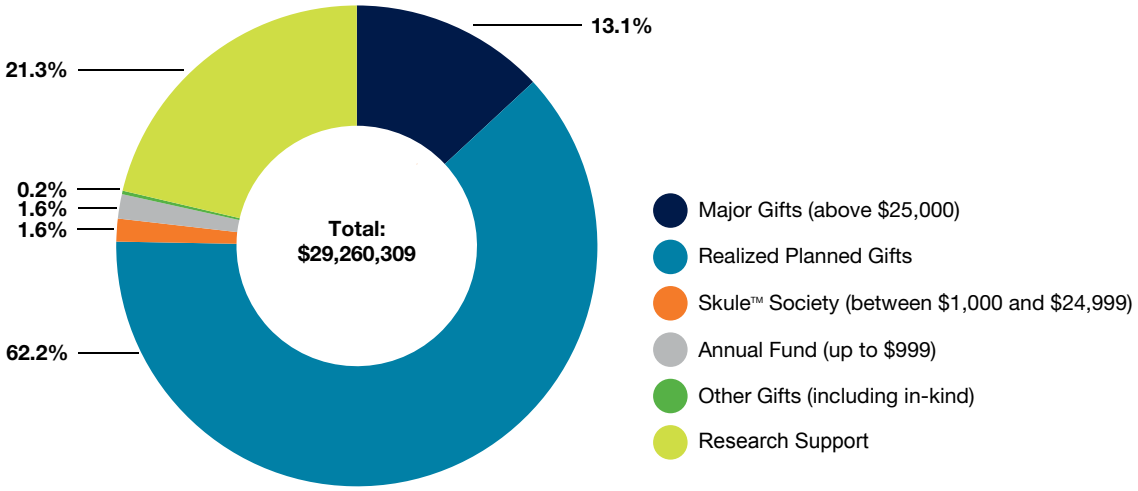
In line with the Academic Plan, we have made significant progress in strengthening the philanthropic support that enables our faculty and students to innovate, share and advance engineering knowledge. In 2015–2016, we attracted a total of $29.3 million from our U of T Engineering community, including $23 million in philanthropic gifts and $6.3 million in research support. Two exceptional bequests from the estates of Erwin Edward Hart (CivE 4T0) and William Dunbar (MechE 5T0) will provide support for early-career researchers, graduate students and undergraduate students.

We have raised $180 million toward Boundless: The Campaign for the University of Toronto. This represents 90 per cent of our campaign goal of $200 million. We continue to attract new partners to the Centre for Engineering Innovation & Entrepreneurship (CEIE), the cornerstone of our Boundless campaign. In its February 2016 budget, the Ontario government announced a $15 million investment in the CEIE as part of its innovation strategy. We also continue to discuss prospective donor naming opportunities at a variety of levels, including the Student Lounge, the Fabrication Facility, the Institute for Robotics & Mechatronics, Research Space and the CEIE Tables & Benches campaign. Construction is progressing, and we are planning ways to celebrate the tremendous contributions of our U of T Engineering community to this project in fall 2016.

We launched our first Spring Reunion Giving campaign in 2016, providing returning alumni with a chance to give back to U of T Engineering either in person at the event, online or by mail.

We continued to engage our fourth-year undergraduate students through the Graditude giving program. One-third of graduating students took part, with MinE and MSE both achieving 100 per cent participation rates. Graditude offers graduating students, as well as faculty, staff, alumni and friends, an opportunity to give back to Skule™ and enhance the experiences of students who will follow them.

Figure 7.1a **Advancement Results, 2015–2016**



Data in this chapter are presented by fiscal year (May to April).
Note 7.1a, 7.1b and 7.1c: Data are shown by fiscal year (May to April).

Figure 7.1b **Philanthropic Support, 2006–2007 to 2015–2016**

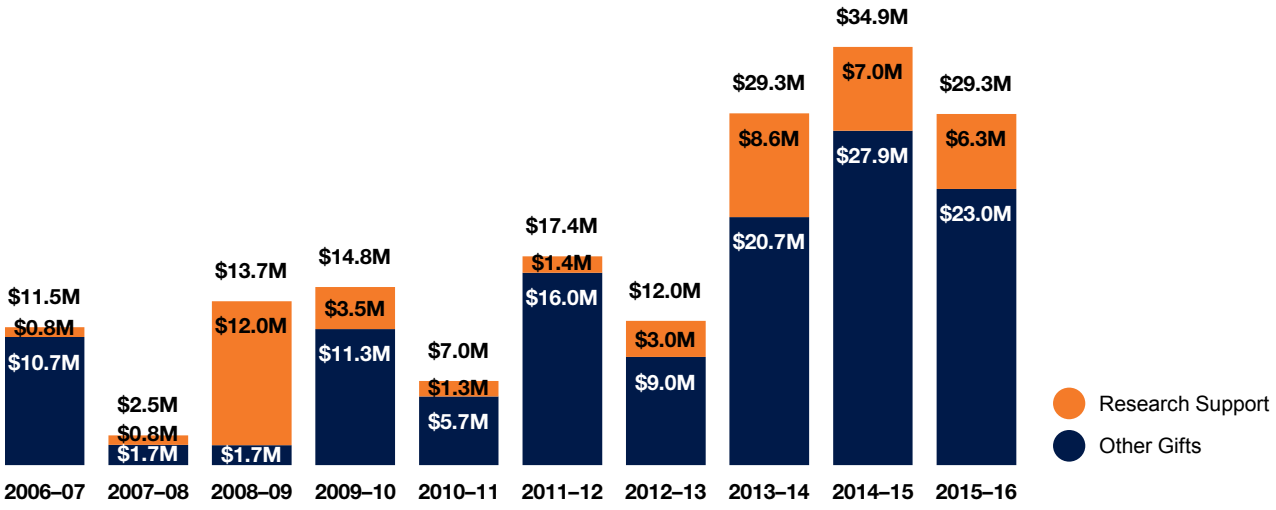


Figure 7.1c **Gift Designation, 2015–2016**

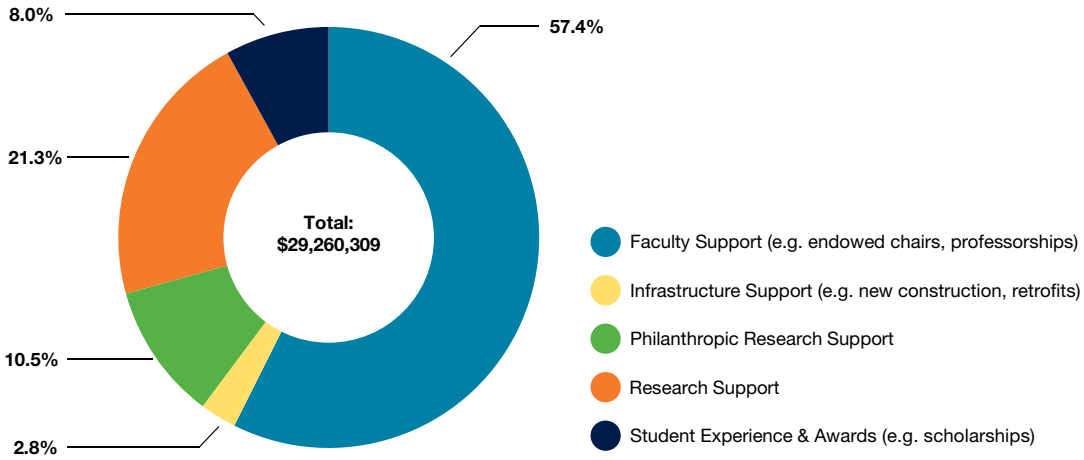
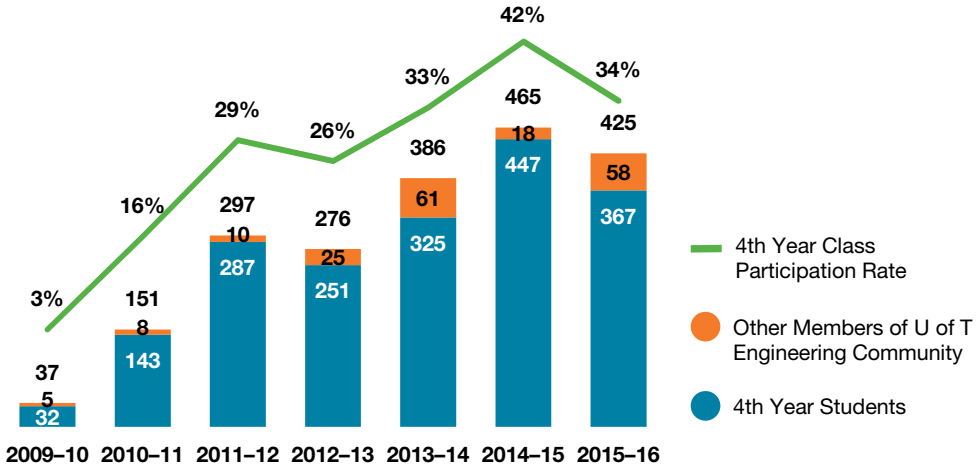


Figure 7.1d **Graditude Participation, 2009–2010 to 2015–2016**



Initiatives and Projects

Social Media Engagement

We significantly expanded our presence on social media in 2015–2016 with the rollout of the Graduway alumni network platform across a number of departments. By combining the power of U of T Engineering's brand with the connectivity of social networks, Graduway enhances our ability to connect with our global community of alumni and facilitates further engagement through mentorship and volunteer opportunities. It also provides us with key data on industry affiliations, which in turn could increase opportunities for research collaborations. After successful beta-testing in EngSci, we introduced the platform in CivE, ChemE and MIE.

Leadership Annual Giving, Class Giving and Special Projects

Annual gifts of between $1,000 and $25,000 enhance our research and educational programs in many ways, from improvements to laboratory facilities to scholarships and funds for student co-curricular activities. This year, a Leadership Annual Giving (LAG) Officer was hired to give special attention to this important class of donors. The role includes analyzing and improving current stewardship practices, and developing a Class Giving strategy to better promote and support peer-to-peer fundraising.

Alumni Events and Engagement

The cornerstone of our U of T Engineering community is our diverse and accomplished network of more than 48,000 alumni around the world. We invite them to see Skule™ not only as a place where they have earned a degree, but also as an ongoing resource for ideas, networking and partnerships. To nurture this engagement, we create opportunities for them to connect with faculty members, students, fellow alumni and industry partners, including learning events and volunteer opportunities. These activities strengthen our alumni network, cultivate new collaborations, highlight our commitment to excellence and encourage alumni to support our vision.

In 2015–2016, we held 84 networking and professional development events for alumni around the world. These events included:

- A Spring Reunion event for alumni who graduated between five and 15 years ago at the Steam Whistle Brewery. Nearly 200 young alumni attended the event, which included brewery tours and a presentation on identifying your online brand.
- The Engineering Society Heritage Awards Celebration, which included alumni who held leadership roles in the Engineering Society and current Engineering Society leaders. Approximately 150 people attended the event, including 52 alumni.
- Four BizSkule events in Toronto, Calgary and California's Silicon Valley on topics such as the future of health care, the new sharing economy and deep genomics. BizSkule showcases engineering leadership in business through keynote speakers and industry panellists ranging from startup founders to global executives.

We also continued to engage alumni in our recruitment and outreach programs. For example, we invited key alumni to serve as ambassadors in student recruitment campaigns in Vancouver, Palo Alto and San Francisco, and Hong Kong, and at post-offer receptions in Vancouver, Dubai and Singapore. These opportunities enable our alumni to share their Skule™ experiences with potential students and offer those students insights into the boundless opportunities that a U of T Engineering degree offers.

We also grew our Alumni Mentorship Program in 2015–2016, with 161 mentors and 280 mentees taking part — increases of 33 per cent and 16 per cent respectively over the previous year. This program, which is open to third- and fourth-year students (including students on PEY internships), fosters valuable relationships between Skule™ alumni and students. It also allows alumni to give back in a unique and rewarding way by sharing their knowledge and experience with students who are making important decisions about their engineering careers.

To increase awareness of the positive impact alumni volunteerism has on current students and faculty, we launched a communications campaign to promote

volunteer opportunities and highlight the benefits of giving back to U of T Engineering. The campaign included:

- A dedicated web page outlining volunteer opportunities;
- A five-part news series on alumni volunteers to mark National Volunteer Month (April 2016);
- A feature on seven engaged alumni volunteers; and
- An ad in Skulematters magazine.

Other key communications initiatives included:

- Redesigning our quarterly alumni e-newsletter, beginning with the fall 2015 issue. This resulted in a 37.3 per cent open rate, 15 percentage points higher than the industry benchmark, leading to an additional 1,100 alumni readers per issue over 2014–2015. The newsletter also achieved a 13.6 per cent click-through rate, 11 percentage points higher than the industry benchmark.
- Highlighting the accomplishments of engineering women in our community through our alumni magazine *Skulematters*. This issue demonstrates the myriad ways diversity enriches the engineering profession, drives innovation and enhances the student experience.

Alumni engagement with our website and social media channels (Twitter, Facebook and LinkedIn) increased across the board in 2015–2016 as we focused on creating relevant content. Highlights include:

- A total of 78 news stories were published and/or repurposed from the Faculty news website, 20 more than the year before, marking a 34 per cent increase in published content.
- Overall pageviews for the alumni website (alumni.engineering.utoronto.ca) increased by 24 per cent to 68,834 from 55,392 the previous year.
- Traffic to the alumni website from links shared on Facebook increased by 27 per cent (1,411 in 2014–2015 vs. 1,791 in 2015–2016).
- Traffic driven to the alumni site from links shared on Twitter increased by 48 per cent (215 in 2014–2015 vs. 318 in 2015–2016).
- Traffic to the alumni site from links shared on LinkedIn increased by 51 per cent (174 in 2014–2015 vs. 263 in 2015–2016).

Gift Highlights

Erwin Edward Hart — $20 million

A historic $20-million bequest from the estate of alumnus Erwin Edward Hart (CivE 4T0), announced in May 2016, enabled us to support early-career professors and provide enhanced opportunities for graduate students.

The income from the Hart Trust created the Percy Edward Hart and Erwin Edward Hart Professorships. Seven faculty members, each within the first 10 years of his/her academic career, received $75,000 per year for three years for research and graduate student support. The recipients were nominated by their department or institute and demonstrated a high level of research excellence and exemplary graduate mentorship. The professorships will foster the next generation of engineering research leaders and educators, and enhance our ability to recruit top early-career educators and researchers from around the world.

The seven professors are:

- Natalie Enright Jerger (ECE) – Percy Edward Hart Professor in Electrical and Computer Engineering
- Tobin Filleter (MIE) – Erwin Edward Hart Professor in Mechanical and Industrial Engineering
- Philippe Lavoie (UTIAS) – Percy Edward Hart Professor in Aerospace Engineering
- Alison McGuigan (ChemE) – Erwin Edward Hart Professor in Chemical Engineering and Applied Chemistry
- Daman Panesar (CivE) – Erwin Edward Hart Professor in Civil Engineering
- Jonathan Rocheleau (IBBME) – Percy Edward Hart Professor in Biomaterial and Biomedical Engineering
- Chandra Veer Singh (MSE) – Erwin Edward Hart Professor in Materials Science and Engineering

Erwin Edward Hart, was a long-time employee of Massey-Ferguson Ltd. and served as the company's chief welding engineer. The professorships are named in honour of Hart and his late father, Percy Edward Hart.

William Dunbar — $1.8 million

A bequest of $1.8 million from the estate of William Dunbar (MechE 5T0) is funding new scholarships for mechanical engineering graduate students based on academic merit. Annual income from the endowment will support the William Dunbar Memorial Scholarships in Mechanical Engineering for graduate students.

Troost Family — $1.1 million

Bill (ChemE 6T7) and Kathleen Troost enhanced their support for leadership education at U of T Engineering in 2015–2016 with a $1 million gift for the Institute for Leadership Education in Engineering (ILead) to enrich co-curricular leadership training and $125,000 for the Department of Chemical Engineering & Applied Chemistry's Leaders of Tomorrow Program. With these new gifts, the Troost family has contributed more than $7 million to the Faculty, including a $2-million gift to create new space for ILead in the Centre for Engineering Innovation & Entrepreneurship. Mr. Troost also generously contributes his expertise to the Faculty as a member of the boards of advisors of both ILead and the Department of Chemical Engineering & Applied Chemistry; and as a Professional Experience Year (PEY) internship employer through his company, Peel Plastic Products Ltd.

8

Communications

By communicating our strengths and accomplishments strategically and creatively through print, digital and earned media, we have strengthened our profile as a global leader in engineering education and research. Strategic communications support our efforts to attract the best students and faculty members from around the world, develop innovative partnerships and inspire our alumni and friends to deepen their engagement with U of T Engineering. The Faculty's communications efforts are carefully aligned with our Academic Plan and the University of Toronto's Three Priorities.

We leveraged our communications channels in new ways in 2015–2016. Over the summer and fall of 2015, we conceived, designed and unveiled Toronto's longest single graffiti installation on the construction hoarding surrounding the Centre for Engineering Innovation & Entrepreneurship. This innovative project allowed us to leverage our urban location to start a public conversation about the positive impact of engineering on society, as well as to celebrate the history and achievements of U of T Engineering. An accompanying media campaign received a Gold Quill Award of Excellence from the International Association of Business Communicators (IABC). In total, we earned more than a dozen communications awards in 2015–2016 and were named Not-for-Profit Communication Department of the Year by the IABC.

We refined our earned media outreach around the Faculty's strategic communications foci, with comprehensive coverage across these priority areas. The visibility of our world-class research was enhanced by content on our U of T Engineering News website and strong pickup in local, national and international outlets across print, online, broadcast and social media. Our renewed focus on social media has led to growing engagement across all channels, strengthening relationships with our vibrant community, particularly students and alumni.

Improving internal communications continues to be a priority. A communications workflow audit in fall 2015 has led to closer coordination among the more than 30 communicators who comprise the Engineering Communications Network. Engineering Strategic Communications is also working closely with colleagues at University of Toronto Communications and communications leaders across the University to strengthen consistency and collaboration in our storytelling.

Selected Communication Projects

CEIExSKAM Graffiti Mural

When the Faculty broke ground in June 2015 on the Centre for Engineering Innovation & Entrepreneurship (CEIE), the construction hoarding surrounding the site offered a unique opportunity to share the U of T Engineering story in an unconventional way. After broad consultation across the Faculty and among University leaders, we commissioned one of Toronto's best-known graffiti artists to produce a 276-foot-long street art installation to highlight our Faculty's history, the importance of engineering in society and the CEIE. The response was positive and measurable, and demonstrates the effectiveness of this campaign in shining a spotlight on the CEIE and our Faculty's world-leading education and research. Twelve stories about the mural appeared in regional media outlets, generating more than 5.5 million impressions. We also had significant online engagement, including 5,500 pageviews on related web stories and more than 1,125 pageviews on an online hub we created on the Faculty website. In addition, more than 5,000 people visited the mural during Nuit Blanche, a city-wide, all-night cultural festival held in October 2015. For more information on the art installation, visit uoft.me/CEIExSKAM.

Integrated Redesign of Offer Package and Admitted Students Website

Receiving an offer of admission to Canada's premier engineering school and one of the best in the world is a pivotal moment in an aspiring engineer's life. To reflect the significance of this accomplishment, we completely reimagined our offer package with the goal of reflecting the excellence of the U of T Engineering experience, while reducing printing and mailing costs.

The Engineering Strategic Communications and recruitment teams collaborated on this project, which integrated both print and digital media. We built and launched a new microsite targeted directly at applicants who had received offers of admission. The site presents reasons to choose U of T Engineering, and each proof point is accompanied by engaging video, photos, testimonials, statistics and details. It drew 2,101 unique visitors and more than 11,700 pageviews.

The printed offer package — a streamlined ensemble containing a personalized letter, informational brochure and a self-mailer envelope — pointed recipients to the microsite. All elements of the project contributed to a cohesive and inspiring piece that presents our Faculty to the world's best students.

Relaunch of the Faculty Homepage

In April 2016, we refreshed the Engineering homepage, our face to the world and the primary platform for information on our Faculty's world-leading education, research and innovation. The new homepage features a cleaner layout and more sophisticated look, prominent visibility for the latest U of T Engineering news, quick access to key facts and info, improved display on mobile devices and shorter loading times. We implemented these changes after carefully analyzing Google Analytics data from the previous 12 months to offer visitors a more efficient and impactful experience.

This enhancement followed the May 2015 launch of a major redesign of the Faculty's main website (www.engineering.utoronto.ca). The redesign included moving the site to the WordPress platform, enhancing search-engine optimization and meeting the highest web accessibility standards set out in both the World Wide Consortium Web Content Accessibility Guidelines and the Accessibility for Ontarians with Disabilities Act.

Enhanced Media Reporting

In April 2015, we formalized an agreement with Media Miser, a media reporting company, to track and evaluate the effectiveness of our earned media strategy, particularly as it connects to the Faculty's Academic Plan and the President's Three Priorities. This service collects all mentions of U of T Engineering in the news media across all platforms — print, online, television and radio — and records reach, value and geographical distribution. In 2015–2016, almost 60 per cent of earned media mentions appeared in international outlets. This widespread coverage underscores both the global impact of our activities, and our strong international reputation.

Strengthening Communications Coordination

The Engineering Strategic Communications team acts as a central hub for communicators working throughout the Faculty's departments, divisions and institutes. The team also works closely with the central University of Toronto Communications office. In 2015–2016 we continued to improve coordination within our Engineering Communications Network, increasing editorial meetings to every second week and closely collaborating on several Faculty-wide communications initiatives, including the design of new Advancement collateral. The Executive

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Data and highlights in this chapter are presented by fiscal year (May to April).
Note: Impressions are an indicator of impact measured by the estimated number of people who may have interacted with a story, based on circulation (newspapers/magazine), viewers (TV), listeners (radio) and unique monthly visitors (online).

Director of Communications attended regular meetings of senior University communications leaders and the Vice-President, Communications to enhance information sharing and University-wide internal communications needs.

Student Communications

In November 2015, we conducted focus groups with engineering undergraduate students across all years to better understand how they consume e-communications received from staff and faculty. Feedback indicated that high email volume combined with messages that are information-dense or difficult to read leaves our students feeling frustrated — not only because of the time they spend sifting through their inboxes, but that high-priority messages sometimes get lost in email bulk and go unread. First-year students were particularly overwhelmed by email volume.

To address this challenge, the Faculty developed an online resource that will help faculty and staff improve the quality of student-facing e-communications while decreasing volume. Through this resource, the Faculty also aims to increase awareness among staff and faculty of all the communication vehicles available to them beyond email. The Faculty plans to roll out the resource in fall 2016 and will measure its success in fall 2017.

Media Coverage

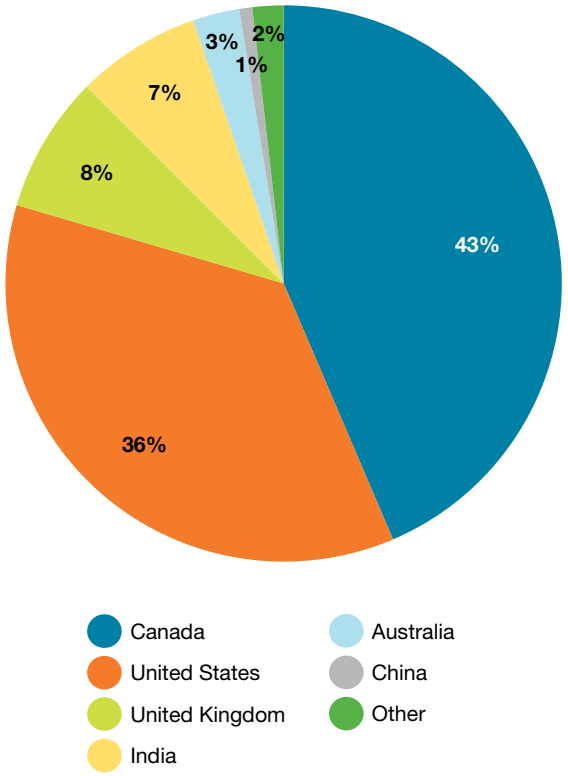
Between May 1, 2015 and April 30, 2016, the Faculty secured more than 3,400 earned media stories in the five priority areas identified in the Faculty's Academic Plan, almost 60 per cent of which appeared in international outlets. This coverage earned more than one billion impressions. This media coverage helps us connect to our global community, gives our Faculty a voice on key issues and enhances the reputation and awareness of U of T Engineering with target audiences, including prospective students and their parents, peer institutions, industry partners, policy makers, influencers and alumni.

The following list includes selected highlights of our media coverage:

Bioengineering/Health

- New 'Tissue Velcro' could help repair damaged hearts *(Vice Motherboard, The Times of India, Gizmodo, Popular Science, New Scientist, Yahoo.ca, Gizmag, The Scientist)*
- A tumour you can unroll: Engineers create new technology for understanding cancer growth *(Vice Motherboard, Engadget, International Business Times, Tech Times, Phys.Org, BiotechDaily)*
- Discovery of 'slithering sperm' could improve infertility treatments *(Toronto Star, Gizmodo, Los Angeles Times, Daily Mail (UK), Popular Science, The Scientist)*
- Shape-shifting engineered nanoparticles for delivering cancer drugs to tumours *(Wired, Phys.Org, The Times of India, News-Medical.Net, Pharmaceutical Processing, Nanowerk, Science Codex, Nanotechnology Now)*
- U of T Engineering researchers create lab-grown heart and liver tissue for drug testing and more *(Toronto Star, CBC The National, CBC.ca, Yahoo! News, Gizmag, Ars Technica, Laboratory Equipment News)*

Figure 8.1a **Proportion of U of T Engineering Media Stories by Outlet Location, 2015–2016**



Note 8.1a: The impressions for one story may be included in the counts of multiple countries.

Sustainability

- Saving sunshine for a rainy day: New catalyst offers efficient storage of alternative energies *(The Globe and Mail, Western Daily Press, Nanowerk, Phys.org, Green Car Congress, ECNmag.com, Design News)*
- Interactive air pollution map for Pan Am Games developed by U of T Engineering researchers *(Metro, CBC Radio One, Urban Toronto, CTV News)*

Engineering Education

- World's fastest bike created by U of T Engineering alumni and students *(Gizmodo, Popular Mechanics, Engadget, CBC.ca, Maxim, The Verge)*
- U of T Engineering hosts Canada's largest STEM event to inspire 1,400 future innovators *(Huffington Post, CBC The National, CBC Metro Morning, Global News, Toronto Star)*
- First-year students in Engineering Science bring design solutions to challenges in Toronto communities *(Toronto Star, City News, 680 News Toronto)*

Entrepreneurship/Commercialization

- U of T Engineering startup applies the power of deep learning to genomics *(Washington Post, The Globe and Mail, Canadian Business, Business Insider, Popular Science)*
- teaBOT, startup launched out of Start@UTIAS accelerator program, expands across North America *(TechCrunch, The New Yorker, BetaKit, The Independent)*

Information & Communications Technology

- Thin, cheap antenna could bring the Internet to unconnected 3 billion *(Tech Times, Physics World)*
- ECE professor explains how his image-recognition research turned into a beauty product *(Washington Post, CTV News, TechCrunch, Toronto Star, Malay Mail Online)*

Figure 8.1b **Proportion of U of T Engineering Impressions by Strategic Priority Area, 2015–2016**

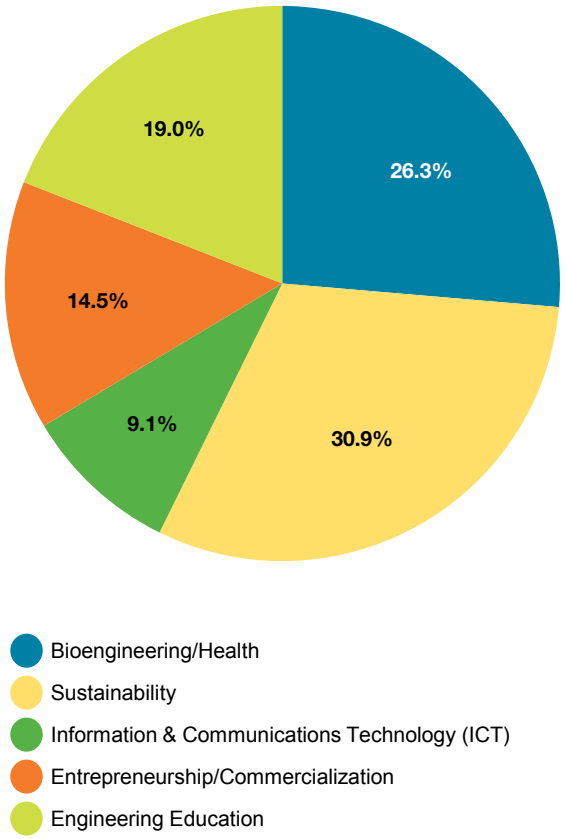
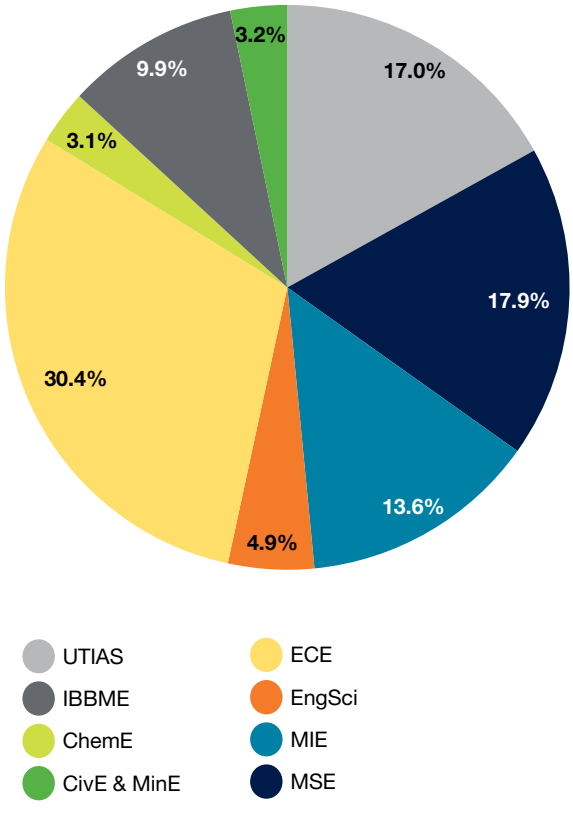


Figure 8.1c **Proportion of U of T Engineering Impressions by Academic Area, 2015–2016**



Note 8.1b and 8.1c: One media story can reference multiple strategic priority areas or academic areas. In those cases, the impressions are included in the counts for both areas. Fig 8.1b does not include an additional 0.2% of impressions that represented areas other than the ones shown here.

Engineering News at U of T

Since its launch in August 2014, the U of T Engineering News website (news.engineering.utoronto.ca) has become the go-to source for Faculty news. In 2015–2016, we published 220 stories on the site. With an emphasis on strategic storytelling that supports the Faculty's priorities, these stories generated 199,555 pageviews, up 74 per cent from 2014–2015. The average time users spent on the page increased slightly, while our bounce rate decreased over the same period the previous year.

International interest in our stories continued to grow, with 35 per cent of pageviews on the U of T Engineering News site coming from outside Canada. More than 22,000 of those pageviews came from the United States, up more than 98 per cent from one year earlier. In 2015–2016, 20 per cent of total traffic originated outside of North America. Readership in India, a region we specifically targeted through proactive media and recruitment outreach, climbed more than 200 per cent over the previous year. We also saw significant gains among audiences in Russia, China, Australia, Japan and Malaysia.

Figure 8.2 **Top Stories on the Engineering News and U of T News Websites, 2015–2016**

Story Title	Date Posted	Pageviews		
		U of T Engineering News Site	U of T News Site	Total
U of T to transform regenerative medicine thanks to historic $114-million federal grant	July 28, 2015	513	11,850	**12,363**
Prime Minister backs regenerative medicine at U of T Engineering	Jan. 14, 2016	997	9,335	**10,332**
Jonathan Sun: Engineer, architect, social media sensation	Feb. 21, 2016	4,814	3,359	**8,173**
Seven U of T engineers awarded Canada Research Chairs	Feb. 9, 2016	1,205	6,060	**7,265**
World's fastest bike created by U of T Engineering alumni and students	Sept. 21, 2015	5,945	116	**6,061**
Hydrogels boost ability of stem cells to restore eyesight and heal brains	May 14, 2015	4,414	1,130	**5,544**
Shape-shifting engineered nanoparticles for delivering cancer drugs to tumours	Feb. 18, 2016	2,705	1,938	**4,643**
Grads to Watch: 16 global engineering leaders	June 12, 2015	4,470	-	**4,470**
Person-on-a-chip: U of T engineers create lab-grown heart and liver tissue for drug testing and more	Mar. 7, 2016	2,260	1,807	**4,067**
University of Toronto breaks ground on new Centre for Engineering Innovation & Entrepreneurship	June 24, 2015	3,662	-	**3,662**
Light up the night at U of T: Scotiabank Nuit Blanche	Sept. 30, 2015	209	3,114	**3,323**
Saving sunshine for a rainy day: New catalyst offers efficient storage of alternative energies	Mar. 24, 2016	1,096	1,748	**2,844**
Five U of T Engineering student startups to watch	May 27, 2015	2,782	-	**2,782**
NBA's Ben Gordon signs on to U of T wearable tech sports coaching startup, Onyx Motion	July 8, 2015	269	2,049	**2,318**
Behind the scenes of Medicine By Design with Molly Shoichet and Peter Zandstra	July 28, 2015	1,111	1,099	**2,210**
A tumour you can unroll: Engineers create new technology for understanding cancer growth	Nov. 23, 2015	755	1,438	**2,193**
Thin, cheap antenna could help bring Internet to the unconnected 3 billion	Jan. 21, 2016	987	1,010	**1,997**
New 'Tissue Velcro' could help repair damaged hearts	Aug. 28, 2015	1,726	241	**1,967**
New U of T Engineering MOOC to teach 100,000 students how to build Swift-based iOS9 apps	Sept. 10 2015	621	1,201	**1,822**
Toronto's longest single graffiti installation celebrates the Centre for Engineering Innovation & Entrepreneurship	Sept. 4, 2015	826	1,004	**1,830**
One U of T Engineering student's passion for cycling becomes startup dream	Mar. 30, 2016	1,799	-	**1,799**
Godiva's Hymn contest winners unveiled at Cannonball	Jan. 12, 2016	1,629	-	**1,629**
U of T grads in finals for Hult Prize — with talking stickers to boost literacy for impoverished children	Sept. 18, 2015	192	1,377	**1,569**
Designing across cultures: Engineering undergrads in China	Jan. 8, 2016	359	1,144	**1,503**
Five innovative ways the new CEIE will engineer tomorrow's entrepreneurs	May 27, 2015	1,475	-	**1,503**
Flight MH370: Forensic engineering expert on the significance of debris	Aug. 4, 2015	176	1,220	**1,396**
Royal Society of Canada: Meet U of T's newest Fellows	Sept. 10, 2015	158	1,153	**1,311**
15 U of T Engineering students honoured with 2016 Gordon Cressy Student Leadership Awards	Apr. 21, 2016	1,284	-	**1,284**
Winds of change: U of T engineers design windmills for Nicaragua	Jan. 26, 2016	1,012	254	**1,266**
Meet four international scholars from U of T Engineering	Dec. 17, 2015	1,245	-	**1,245**
U of T biomedical engineers may have solved the problem of protein binding	Mar. 17, 2016	78	1,108	**1,186**

Online Activity

Faculty Website

Since launching our new Faculty website (www.engineering.utoronto.ca) in May 2015 with continuous improvements in architecture and design, the average length of time users spend per page has climbed more than 38 per cent and the bounce rate has decreased by almost four per cent. This indicates that visitors to the new site are finding the information they seek more easily. Almost one-third of traffic to the Faculty site came from outside of Canada. The number of users accessing the site via mobile devices climbed slightly to 17.4 per cent from 16.8 the previous year, underscoring the importance of mobile compatibility across the entire suite of Engineering websites.

Recruitment and Admissions Websites

Our website is an important source of information for prospective students and their parents and families, a powerful tool in our recruitment strategy, and an opportunity to communicate our position as Canada's top engineering school and one of the best in the world. In 2015–2016, pageviews on our primary recruitment site, Discover Engineering (www.discover.engineering.utoronto.ca), rose by 28 per cent over 2014–2015. Our improved search-engine optimization delivered twice as much traffic from organic searches compared with the previous year. More than one-third of visits to Discover Engineering originated outside of Canada, with traffic from the United States growing by 52 per cent over the previous year.

We launched the "You Belong Here" microsite for admitted students on November 25, 2015. Since its launch, the site — which was marketed to admitted students in their offer packages and not indexed by Google — has received 9,100 unique pageviews from students in more 77 countries. Forty-three per cent of its traffic originates outside of Canada, with the majority coming from the United States, Russia, China, the United Arab Emirates and Japan. The site boasts a very low bounce rate of 35 per cent, which illustrates the quality, value and accessibility of its content.

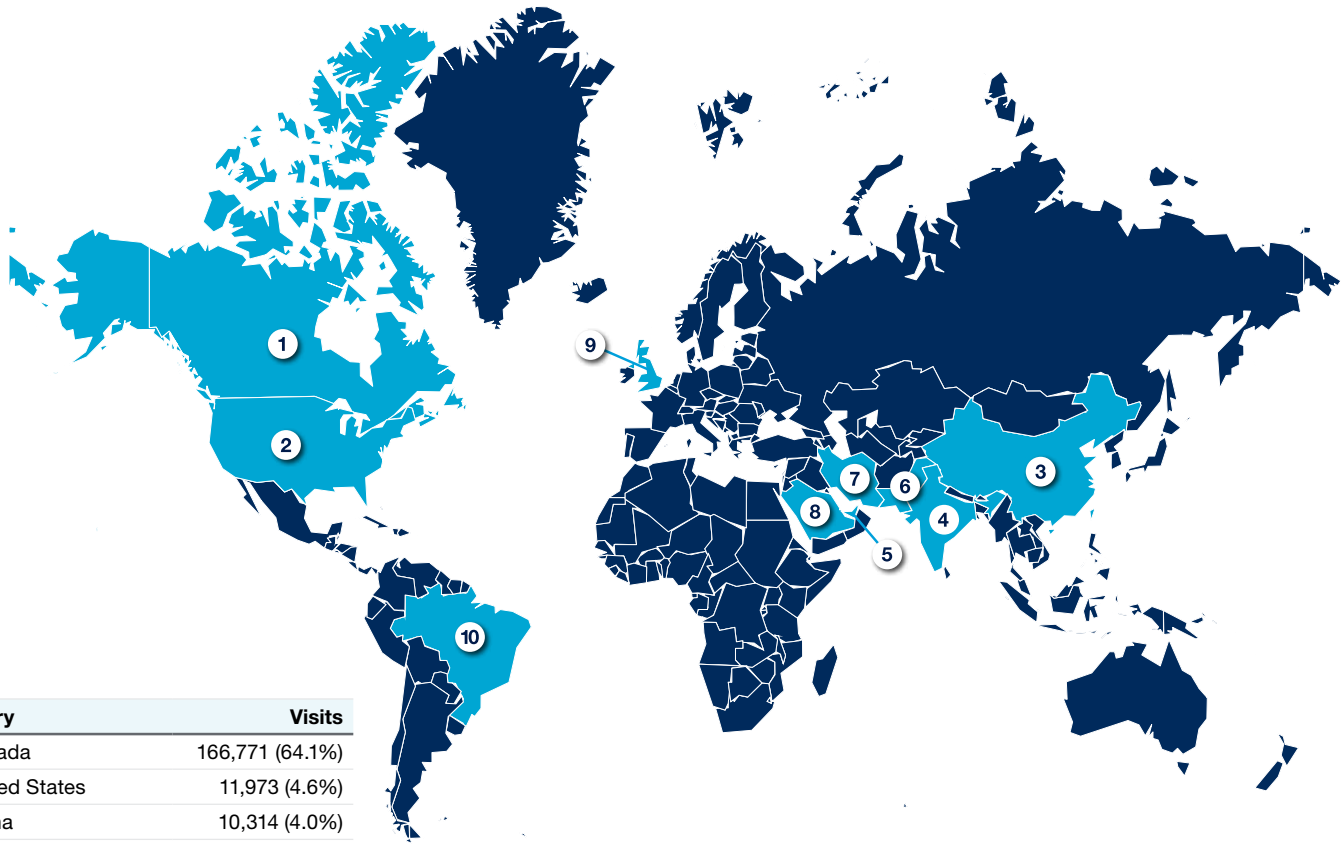
Figure 8.3a Summary of Analytics for Faculty and News Sites, 2015–2016

	Faculty Site	News Site
Pageviews	455,808	199,555
Unique visitors	156,698	104,255
Average number of pageviews per session	1.75	1.43
Average amount of time spent on site	2:33 min	0:59 min
Cities of origin	6,063	6,619
Countries of origin	193	192

Figure 8.3b Summary of Analytics for You Belong Here Microsite, Nov. 25, 2015 to April 30, 2016

	You Belong Here Microsite
Pageviews	11,714
Unique visitors	2,101
Average number of pageviews per session	3.12
Average amount of time spent on site	4:11 min
Cities of origin	507
Countries of origin	77

Figure 8.4 **Visitors to Discover Engineering Site: Top 10 Countries, 2015–2016**



Country	Visits
1. Canada	166,771 (64.1%)
2. United States	11,973 (4.6%)
3. China	10,314 (4.0%)
4. India	9,263 (3.6%)
5. United Arab Emirates	3,794 (1.5%)
6. Pakistan	2,952 (1.1%)
7. Iran	2,633 (1.0%)
8. Saudi Arabia	2,533 (1.0%)
9. United Kingdom	2,449 (0.9%)
10. Brazil	2,448 (0.9%)

Social Media

Engaging our key audiences through social media continues to be a priority for the Faculty. In 2015–2016, we expanded the reach of our social media channels, including Facebook and Twitter, and in January 2016 relaunched our Instagram channel with a new focus on engineering student life and our vibrant engineering community. Since this relaunch, we have seen a surge of engagement on Instagram, and have tripled our number of followers from 400 in January 2016 to more than 1,200 in June 2016.

We continue to refine our messaging and define our unique U of T Engineering voice across both Facebook and Twitter channels. This strategy has delivered demonstrable gains: between May 1, 2015 and April 30, 2016, Facebook impressions — a measure of reach — grew by 465 per cent, and engagements — an indicator of the value of the content to the audience — grew 447 per cent over the same period the previous year. We also increased the volume of our Twitter messaging by more than 77 per cent, and this grew our number of engagements by almost 600 per cent over 2014–2015.

Overall, U of T Engineering engaged with more than 6,800 unique users in 2015–2016, for a potential total reach of 3.8 million social media users who saw our U of T Engineering-related content.

9

International Initiatives

From sustainable energy and clean water to public health and urban transportation, we are using our technical and problem-solving competencies to develop solutions to the world's most pressing challenges. At U of T Engineering, our outlook and impact are global, and we embed international perspectives in our research and our curricular and co-curricular programs. The Faculty's robust global engagement also strengthens U of T's international partnerships, one of the Three Priorities outlined by President Meric Gertler.

Our strong position in global rankings, the strength and breadth of our academic programs and our outstanding international reputation continue to draw exceptional international students who enrich our Faculty and deepen the engineering creative process with new ideas and perspectives. In 2015–2016, more than one-quarter of our undergraduate students and nearly one-third of our graduate students came from outside Canada. To enhance our ability to attract top international undergraduate students, in 2015 we introduced the U of T Engineering International Scholar Award, which covers the full cost of tuition and is renewable for four years. We are also diversifying our cohort of international students by increasing strategic recruitment in underrepresented regions such as South Asia, Latin America and the United States. We continued to welcome international students through targeted programs such as the International Foundations Program.

International educational exchanges, research programs and professional placements allow our students to gain cross-cultural fluency and experiences that enhance their understanding of complex global challenges. In 2015–2016, 89 students participated in outgoing exchanges to peer institutions such as the Massachusetts Institute of Technology, ETH-Zurich Swiss Federal Institute of Technology and National University of Singapore. Seventy-nine students gained invaluable international work experience by completing Professional Experience Year internship placements outside Canada. Many of our students also participated in international capstone courses and summer research opportunities that enhanced their abilities to work across borders and cultures.

Our multidisciplinary centres and institutes — such as the Centre for Global Engineering, the Institute for Sustainable Energy and the Institute for Water Innovation — bring together researchers from diverse disciplines to collaborate on projects that have the potential to improve the lives of people around the world, particularly in developing countries. These researchers and rich international opportunities become catalysts for global change.

International Students and Exchanges

We attract some of the finest students from around the world because of our excellent programs, extraordinary researchers, outstanding position in global rankings and location in one of the world's most vibrant, safe and diverse cities. In 2015–2016, international students made up 27.4 per cent of our undergraduate students, building on our success in meeting our Academic Plan goal of 25 per cent by 2015. The proportion of international graduate students also increased to 31.1 per cent.

To broaden the diversity of our international student population, we enhanced our recruitment efforts in 2015–2016 in key regions, including South Asia, Latin America and the United States. In addition to school visits, university fairs and guidance counsellor events, we also awarded scholarships to the 2016 DEEP Summer Academy to top entrants at three science fairs in northern California. We supplemented travel to these regions with digital outreach, including online chats, e-newsletters and "virtual visits" to STEM-focused high schools in California, Illinois, Massachusetts, North Carolina, New York and Texas.

Several targeted programs bring international students to the Faculty and enrich the diversity of our student population. We also offer numerous opportunities for our students to gain international experience.

Figure 9.1a **Selected Opportunities for International Students to Study at U of T Engineering**

Program	Description	2015–2016 U of T Engineering Participants
Ciência sem Fronteiras (CsF) (formerly Science without Borders)	Funded by the Government of Brazil and private industry, CsF sends Brazilian students abroad to study science, technology, engineering and mathematics. 2015–2016 was the final year of this program.	81 (Fall term) 56 (Winter term)
International Foundations Program (IFP)	IFP allows academically strong students who do not meet the University's minimum English proficiency requirements to receive a conditional offer of admission as non-degree students. After completing an intensive, eight-month English-language program as well as APS Engineering Strategies & Practice, these students continue in an engineering program.	25
Graduate International Foundations Program (G-IFP)	G-IFP is similar to IFP, but is aimed at graduate students. Upon completion of English classes and one ELITE course (APS 1012), they move into the MEng program in the winter term. 2015 was the final cohort for this program.	16
MasterCard Foundation Scholars Program (MFP)	MFP provides talented young people from economically disadvantaged communities, particularly in sub-Saharan Africa, with access to quality and relevant education.	18, including 9 first-year students

Data and highlights in this chapter are presented by academic year (September to August).

Figure 9.1b **Selected Opportunities for U of T Engineering Students to Study or Work Abroad**

Program	Description	2015–2016 U of T Engineering Participants
Professional Experience Year (PEY) Internship	PEY places second- and third-year students in 12- to 16-month internships with employers in Canada and abroad.	79 international placements (50 U.S. placements and 29 other international placements)
Summer Research Abroad, Structured Exchange Pathways and other exchange programs	Programs administered by U of T's Centre for International Experience or coordinated by the Faculty allow students to conduct research internships or pursue academic courses at partner institutions abroad.	89
Global Educational Exchange (Globex)	Globex brings professors and students from engineering schools around the world to Peking University in Beijing, China, each summer for a three-week program. The Department of Mechanical & Industrial Engineering became the first Canadian partner in 2012.	21
Exceptional Opportunities Award	The Exceptional Opportunities Award supports Engineering Science students who have secured summer research opportunities abroad apart from those arranged by the division or the Centre for International Experience.	4 awarded in summer 2016; host institutions included Carnegie Mellon University, National University of Singapore and Stanford University

International Scholar Award Attracts Top Students

Two students from Jordan and Singapore are the first recipients of the University of Toronto Engineering International Scholar Award, a new scholarship that enhances our ability to attract top students from around the world.

The award recognizes exceptional international students who are involved in extra-curricular activities and want to use their engineering careers to improve the world. It covers full tuition and is renewable for up to four years. Tamara Abugharbieh (Year 1 EngSci) and Katherine Bancroft (Year 1 General First Year) received the award in 2015–2016.

18 MasterCard Foundation Scholars Study at U of T Engineering

Nine MasterCard Foundation Scholars joined the entering class at U of T Engineering in 2015–2016, bringing the total number of scholarship recipients studying at the Faculty to 18. Through this program, the MasterCard Foundation has committed $500 million over 10 years to provide disadvantaged students, primarily from sub-Saharan Africa, the opportunity to study at universities around the world. Students receive funding for tuition, books and living expenses, as well as support for internship, volunteer and social activities.

Selected International Education and Research Partnerships

International Partnerships

International agreements create academic pathways and partnerships that enhance our engagement with peer institutions around the world. Through these relationships, our students gain unique opportunities to increase their global fluency through summer research exchanges and cross-cultural engineering design projects, and by sharing classes with students from partner universities. International agreements also formalize and strengthen collaboration between our faculty members and researchers around the world. As of June 2016, our Faculty had 31 active international agreements, with access to other top institutions through University-wide partnerships.

In 2015–2016, U of T Engineering entered into new agreements on academic and research exchanges and student mobility with the following peer institutions:

- Centrale Supélec (France);
- Scuola Internazionale Superiore di Studi Avanzati (Italy);
- Tianjin University (China);
- Tongji University (China); and
- Yonsei University (South Korea).

In addition, agreements between UTIAS and Shanghai Jiao Tong University (SJTU) were finalized that will enable select SJTU students to complete a MEng at U of T, as well as a separate agreement for a joint placement PhD.

We have also begun the process of converting our expiring memorandum of understanding with South China University of Technology — which allowed its students to complete their final undergraduate year at U of T Engineering and gain conditional acceptance to our MEng program — to a dual degree program.

Improving Transportation at the World's Largest Gathering

Professor Amer Shalaby (CivE) is playing a key role in making the pilgrimage to Mecca safer for more than two million Muslims who gather there each year to perform the hajj, one of the five pillars of the faith.

Shalaby is working with authorities in Saudi Arabia on transportation studies to inform the development of infrastructure and crowd management systems. A main goal is to prevent deadly crowd crushes such as the one in September 2015 that killed more than 1,000 people, an estimate which may change pending an ongoing investigation. With roughly 2.5 million pilgrims in attendance in recent years, the five-day hajj is considered to be the largest annual gathering of people in the world.

Shalaby, a member of the University of Toronto Transportation Research Institute (UTTRI), focuses on transportation infrastructure systems that can adapt to massive, sporadic population spikes, such as the hajj. He has served on the technical advisory panels of studies planning the shuttle bus system, pedestrian network and metro system in Mecca. He also serves on the international advisory panel for the Medina Mosque Expansion project, and helps guide the research program of the Transportation and Crowd Management Center of Research Excellence at Umm Al-Qura University in Mecca as a member of its advisory board and head of its International Scientific Committee.

His work has the potential to not only increase safety and efficiency during mass events, but also provide guidance on the unprecedented number of large-scale transportation projects that emerging countries are building to meet the demands of population growth and urbanization.

International Partnership Aims to Design the Next Generation of Aircraft Landing Gear

In April 2016, Professor Kamran Behdinan (MIE) was awarded a three-year NSERC Collaborative Research and Development to develop an integrated computational methodology for the design, testing and development of the next generation of landing gear.

Behdinan and his research group will work in partnership with SPP Canada Aircraft Inc. and its Japanese parent company, Sumitomo Precision Products Co., a world leader in the design of aircraft landing gear. The landing gear is essential to aircraft safety and relies on many complex and interdependent mechanical components: the retraction-extension mechanism, locking system, tires and 'shimmy damper' that controls the lateral vibration on landing all work together to prevent failure on landing.

Behdinan's group will conduct drop tests to validate impact measurements and simulate lateral vibrations of the landing gear when it hits the ground. Their results will inform new computational tools that will be used to optimize the cost and weight of landing gear, as well as to reduce noise pollution, all while maintaining the highest level of safety.

Saving Sunshine for a Rainy Day: New Catalyst Offers Efficient Storage of Alternative Energies

A multinational collaboration led by Professor Ted Sargent (ECE) has resulted in the most efficient catalyst for splitting water into hydrogen and oxygen. This process, which mimics that of plants during photosynthesis, allows the storage of electricity from intermittent sources, such as wind and solar, in chemical form.

The new catalyst is made of the abundant metals tungsten, iron and cobalt, making it much less costly to produce than state-of-the-art catalysts based on precious metals. It showed no signs of degradation over more than 500 hours of continuous activity, unlike other efficient but short-lived catalysts. Their work was published in the leading journal *Science*.

This research united engineers, chemists, materials scientists, mathematicians, physicists, and computer scientists across Canada, the United States and China. The team includes researchers at Stanford University, East China University of Science & Technology, Tianjin University, Brookhaven National Laboratory, the Canadian Light Source and the Beijing Synchrotron Radiation Facility.

Food & Nutrition Security Engineering Initiative

The Centre for Global Engineering (CGEN) is bringing together researchers from across the Faculty of Applied Science & Engineering in a multidisciplinary collaboration to address hunger and malnutrition, which affect billions of people around the world.

The Food & Nutrition Security Engineering Initiative (FaNSEI) seeks to leverage the Faculty's diverse expertise to advance engineering solutions to these issues.

Its multidisciplinary approach recognizes that food and nutrition are complex challenges that are often intertwined with other issues such as agricultural productivity, water availability, energy resources, food preservation, transport and storage — areas in which the Faculty has outstanding strengths.

The group has received seed funding from the Dean's Strategic Fund, which supports strategic collaborations that have a broad impact in the Faculty. FaNSEI members include CGEN Director Professor Yu-Ling Cheng (ChemE) and Associate Director Professor Amy Bilton (MIE), and Professors Edgar Acosta (ChemE), Stewart Aitchison (ECE), Timothy Chan (MIE), Levente Diosady (ChemE), Elizabeth Edwards (ChemE), Chi-Guhn Lee (MIE), Emma Master (ChemE) and Arun Ramchandran (ChemE).

The team has also partnered with U of T researchers outside engineering, including plant biologists and experts in food security and nutrition.

Improving Global Health Through Micronutrients

Researchers at U of T Engineering are fortifying universally consumed foods such as tea and salt with critical micronutrients to improve public health in the developing world. Micronutrients, such as iron, folic acid and vitamin B-12, are needed in only small quantities but are crucial for good health, particularly among women and babies.

Professor Levente Diosady (ChemE) and his team have created tiny edible particles that are rich in iron. The particles are mixed with traditional iodized salt to create double fortified salt (DFS). Diosady has teamed up with the Micronutrient Initiative to distribute DFS to more than five million children a day in India's Tamil Nadu province, with an initial trial showing a 35 per cent reduction in anemia within eight months. The project is expanding to the province of Uttar Pradesh, where it will be given to between 10 million and 20 million people.

Diosady is also working on incorporating folic acid and vitamin B-12 into salt, and iron into tea. Both salt and tea are consumed in predictable amounts in the developing world, regardless of economic status.

International Capstone Course Challenges Students to Design Across Cultures

More than a dozen U of T Engineering students and professors spent four days in China in November 2015 collaborating with colleagues from two universities on projects ranging from satellite design to assistive devices. The trip was part of the Department of Mechanical & Industrial Engineering's fourth-year international capstone course, which allows students to work collaboratively across continents and cultures on industry-sponsored engineering projects.

The course, which is celebrating its fifth anniversary, includes partnerships with Peking University (PKU) in Beijing, the National University of Singapore, the University of California, Irvine and, new this year, Beijing's Tsinghua University. Industrial partners in Canada or the partner country sponsor the projects.

The students, who conducted most of their work via e-mail and other online tools, met in Toronto in April 2016 to present their final designs.

Winds of Change Bring Water to Drought-Prone Area

Professor Amy Bilton (MIE) and her students have partnered with residents of Pedro Arauz, Nicaragua, to design and construct a water-pumping windmill, providing critical irrigation during the area's long dry season.

The project was part of a fourth-year capstone design course in the Department of Mechanical & Industrial Engineering. Over the last two years, three different teams of undergraduate students have worked closely with members of the community and Winds of Change — an initiative started by Canadians John Shoust and Rob Scott — to make the windmill a reality.

The area has plenty of groundwater and dug wells, but lacks the technology to pump the water efficiently. Hand pumps are not powerful enough to produce the thousands of gallons of water required for crop irrigation, while the use of diesel and electrical pumps is limited by a lack of infrastructure, high cost and difficulties with the importing of goods. By contrast, wind pumps can be built and maintained using locally available materials, and the climate in Nicaragua is windy enough to provide the required energy.

During the first two trips to Nicaragua, in fall 2014 and spring 2015, the teams took wind speed measurements, consulted extensively with community members about their resources and irrigation needs, designed the windmill and dug the foundation. In January 2016, Bilton and some of the students returned to Pedro Arauz and built the windmill out of wire, sheet metal and PVC piping in four and a half days.

10

Diversity deepens the engineering creative process, enriches the teaching and research environment, enhances the experiences of our students and enables accelerated innovation. As Canada's premier engineering school, we have a responsibility to lead in advancing diversity and we play a key role in enriching the engineering profession by ensuring candidates eligible for professional licensing better reflect the rich diversity of our society.

We have made excellent progress in recruiting female students to our undergraduate program, with women comprising more than 30 per cent of our first-year cohort — the highest proportion of any entering engineering class in Ontario — for the second year in a row. We expect the number of women in our graduating classes will continue to grow, expanding the number of potential female applicants to graduate programs and the number of women professional engineers. Our progress supports our commitment to a broader coalition that aims to increase the proportion of women to 30 per cent of all newly licensed engineers by 2030. Currently, fewer than 12 per cent of practising, licensed engineers in Canada are women.[1]

Our commitment to diversity is also reflected in our faculty. In the past year we have hired 13 outstanding professors, nine of whom are women, whose areas of expertise span the breadth and depth of the profession, including research at the intersection of multiple disciplines that addresses the world's most pressing challenges.

The quality of our programs and our outstanding global rankings continue to attract top students from around the world. Diverse backgrounds and experiences enrich our learning and research environments and fortify our global alumni networks. To further increase the geographic and cultural mix among our international students, we enhanced strategic recruitment initiatives in key regions, including Latin America, South Asia, the Caribbean and the Middle East. We will continue to expand our activities in these areas.

We are also focusing our outreach and recruitment activities to encourage Indigenous students to engage in STEM subjects. We have created a new position to coordinate these initiatives and have struck a committee for discussion of ideas, information, and initiatives to ensure a welcoming and supportive atmosphere for Indigenous students, faculty, staff and communities, and to improve access to engineering education for Indigenous peoples.

[1] Engineers Canada, https://www.engineerscanada.ca/diversity/women-in-engineering

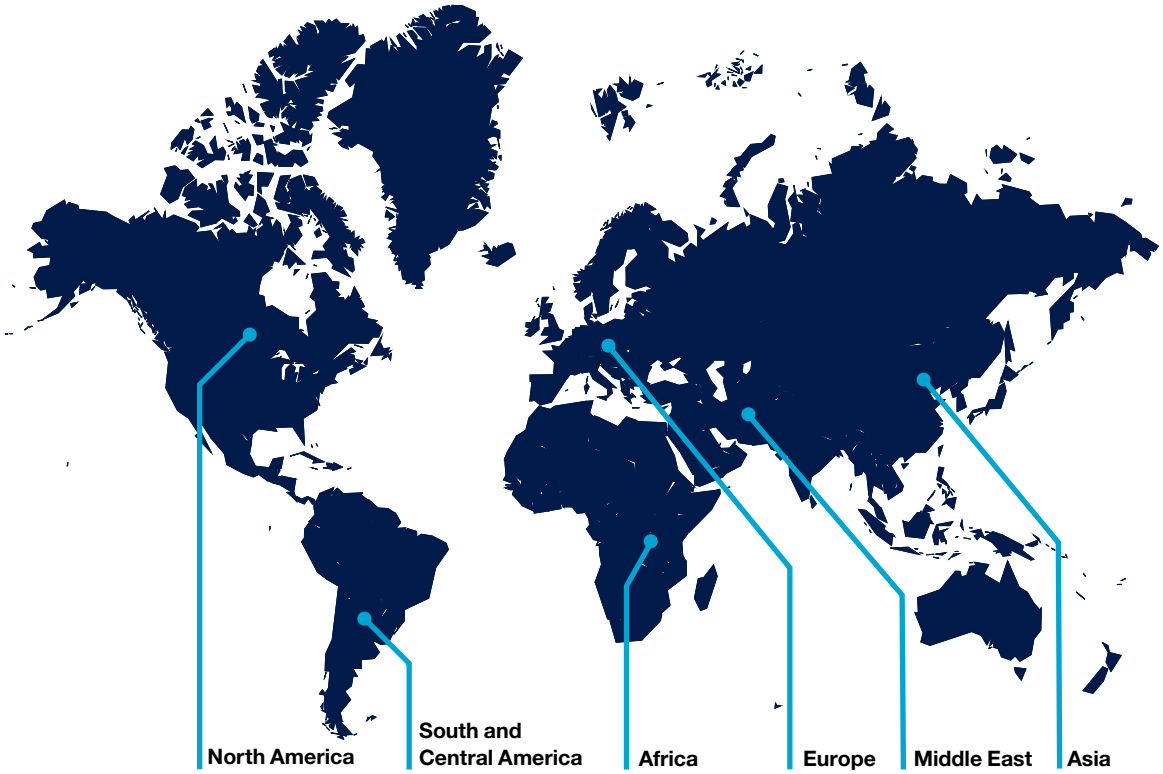
Diversity: Measures of Progress

International Diversity

Our strong international reputation, excellent position in global rankings and vibrant alumni networks enable us to attract outstanding students from around the world. In 2015–2016, 25.8 per cent of our undergraduates were international students, in line with our Academic Plan goal of 25 per cent by 2015, with 30 per cent of our incoming students coming from outside Canada. Among our graduate students, 31.1 per cent are international students, up from 27.1 per cent the previous year. These students enrich our community with different ideas and perspectives, enhance our student experience and broaden our global alumni community and networks.

To enhance diversity among our international students, we increased targeted recruitment initiatives in strategic regions, such as Latin America, South Asia, the United States and the Middle East. *(For more information about our international recruitment initiatives, please see Chapter 9: International Initiatives.)*

Figure 10.1 **Continent of Origin: Undergraduate and Graduate Students, Fall 2015**



	North America	South and Central America	Africa	Europe	Middle East	Asia
Undergraduate Students	54.2%	1.0%	1.1%	1.4%	4.0%	38.2%
Graduate Students	49.6%	1.4%	1.3%	3.2%	13.8%	30.5%
Overall	52.8%	1.1%	1.2%	1.9%	6.9%	36.0%

Data and highlights in this chapter are from September 2015 to August 2016.

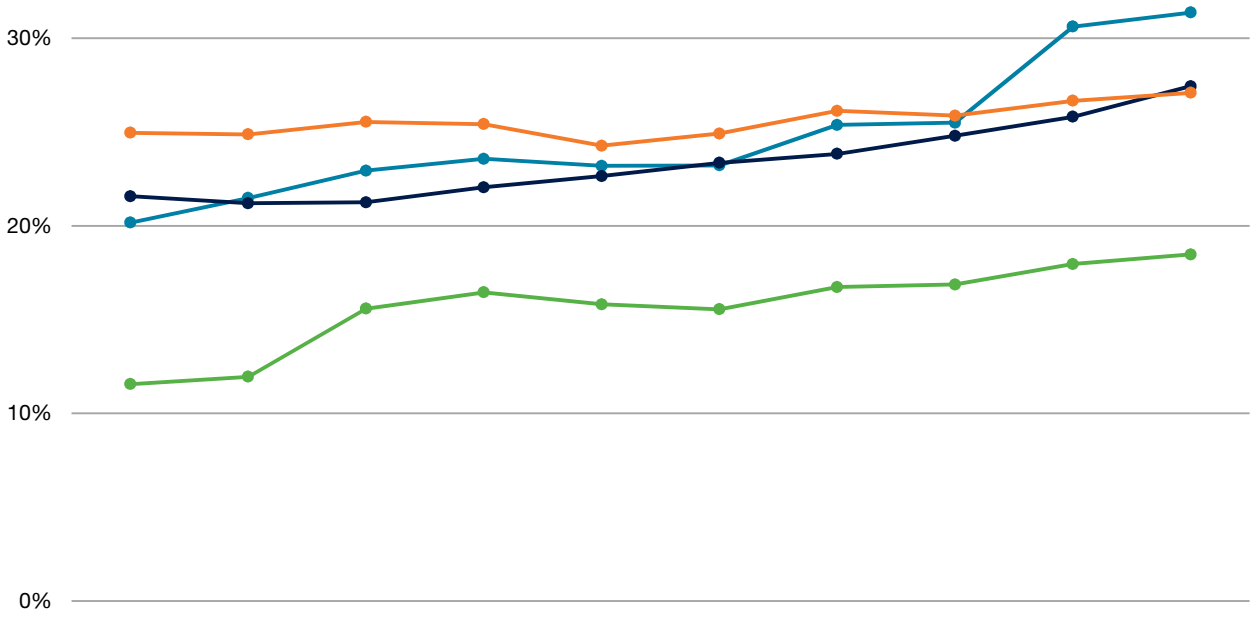
Note 10.1: Not shown—0.1% of undergraduate students and 0.2% of graduate students from Oceania, which includes Australia, New Zealand and other countries in the Pacific Ocean. Country of origin is derived from a combination of citizenship, location(s) of previous studies (e.g., elementary school, high school and university) and permanent address. This information does not indicate current Canadian immigration status, which is used to determine domestic/international student status for tuition and funding purposes.

Outreach and Inclusivity

Through focused outreach and recruitment activities, we have continued to increase gender diversity in our student body. Women made up 31.4 per cent of entering first-year students in fall 2015, the second year in a row that women have comprised more than 30 per cent of our entering class. As a result of this progress in first-year enrolment, the proportion of women in our overall undergraduate population increased to 27.4 per cent, from 25.8 per cent in 2014–2015, and is on track to surpass 30 per cent within a few years. We are driving progress on increasing the percentage of newly licensed engineers who are women to 30 per cent by 2030. Currently, fewer than 12 per cent of practising, licensed engineers in Canada are women.[1]

Our strategic recruitment initiatives seek to expand the pool of female applicants to our programs and increase the number of women who join U of T Engineering. In October 2015, we welcomed more than 70 top female Grade 12 students from the Toronto area at the second annual Young Women in Engineering Symposium (YWIES). This event gave invited students an opportunity to learn more about engineering, participate in experiential workshops and meet students, faculty and alumni, and enabled us to connect with these potential applicants early in the 2016 admissions cycle. We also piloted a mentorship program from February to April 2016 that connected YWIES participants with current U of T Engineering female students. In May 2016, we held our Girls' Leadership in Engineering Experience (GLEE), a weekend-long program for female students with offers of admission to U of T Engineering. GLEE inspires students to learn more about the contributions they can make as engineers and the unique opportunities our Faculty offers. This year, 91 per cent of the 87 students participating in GLEE accepted their offers of admission.

Figure 10.2 **Percentage of Women Students and Faculty, 2006–2007 to 2015–2016**



	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
First Year Undergrad	20.2%	21.5%	22.9%	23.6%	23.2%	23.2%	25.4%	25.5%	30.6%	31.4%
All Undergrad	21.6%	21.2%	21.3%	22.1%	22.6%	23.4%	23.8%	24.8%	25.8%	27.4%
Graduate Students	25.0%	24.9%	25.5%	25.4%	24.3%	24.9%	26.1%	25.9%	26.7%	27.1%
Faculty	11.6%	11.9%	15.6%	16.5%	15.8%	15.5%	16.7%	16.9%	18.0%	18.5%

[1] Engineers Canada, https://www.engineerscanada.ca/diversity/women-in-engineering

Our robust outreach programs are a key aspect of our strategy to engage all students — including women and girls, black students, Indigenous youth and other underrepresented communities — in engineering activities, increasing their awareness of the profession and exposing them to inspiring role models. In 2015–2016, we reached more than 9,000 pre-university students through outreach programs such as:

- Da Vinci Engineering Enrichment Program (DEEP) Summer Academy, which provides motivated high school students from around the world the opportunity to engage in experiential learning activities in a variety of engineering, technology, business and science disciplines;
- Jr. DEEP and Girls' Jr. DEEP, summer day camps and Saturday programs that allow students in Grades 3 to 8 to explore engineering;
- Workshops such as Go Eng Girl and Go CODE Girl, which enable girls in middle and high school to explore engineering and computer coding;
- ENGage, a collaboration between U of T's Chapter of the National Society of Black Engineers and the Faculty of Applied Science & Engineering. ENGage highlights black role models, encourages literacy in science, technology, engineering and math (STEM) and promotes academic and social growth.

We are contributing to nationwide efforts to reduce the educational gaps between Indigenous and non-Indigenous Canadians. These efforts align with calls by the Truth and Reconciliation Commission of Canada. In 2016, we created a new position, Director of Engineering Pathways and Indigenous Partnerships. The Director will coordinate a Faculty-led outreach program to First Nations, Métis and Inuit communities, with the goal of increasing the rate of participation of Indigenous students in Engineering. The Director is also facilitating greater integration of existing outreach, recruitment and retention initiatives, both within the Faculty and across the University, that affect Indigenous engineering students.

We continue to raise awareness of LGBTQ perspectives and experiences in engineering. Members of the U of T Engineering community joined students, faculty and staff across the University in March 2016 to celebrate the 20th anniversary of the U of T Positive Space Committee with a panel discussion at Hart House. Founded in 1996, the Positive Space Committee promotes safe and inclusive spaces across the University for LGBTQ students, staff, faculty, alumni and allies. The most visible aspect of its work is the rainbow triangle stickers that are posted on doors and in offices across campus. Professor Peter Weiss of the Engineering Communication Program moderated the discussion. Ron Suprun (Year 3 IndE), the first non-binary person to take on the role of Godiva's Crown — a spirit position within the Engineering Society that has historically been held by female students — was a member of the five-person panel.

Faculty, staff and students celebrated Pride Month on June 23, 2016 by assembling the pride flag out of 24 three-foot-wide balloons in the atrium of the Bahen Centre. The event was part of a University-wide challenge to #DisplayYourPride, and resulted in a spike of activity on social media, with more than 45,000 impressions across Facebook, Twitter and Instagram and an eight-fold increase in engagement with Facebook posts compared to the same week the previous year.

To ensure we have appropriate supports in place, the Community Affairs & Gender Issues Committee is developing a survey to inform these activities (see Next Steps).

New Faculty Members, 2016–2017

Our international reputation for excellence enables us to attract stellar faculty members from Canada and around the world. In anticipation of new space provided in the upcoming Centre for Engineering Innovation & Entrepreneurship (CEIE), in 2015–2016 we were able to hire a larger cohort of new professors than in most years. These 13 professors will take up their appointments on or before July 1, 2017. These new faculty members — five of whom have budgetary cross-appointments in more than one academic unit — enrich the multidisciplinarity of our Faculty's research and educational programs.

Professor Fae Azhari (MIE, CivE) studied civil engineering at Iran's Isfahan University of Technology and the University of British Columbia before receiving her PhD from the University of California, Davis. She specializes in structural health monitoring of bridges, aircraft, wind turbines and other engineering systems to advance sustainable infrastructure management.

Professor Erin Bobicki (MSE, ChemE) completed her PhD at the University of Alberta, where she studied carbon sequestration, and spent two years working at Intel in Portland, Oregon. She aims to improve the sustainability of mining operations by developing enhanced techniques for mineral processing that reduce energy and water use, as well as the overall environmental impact.

Professor Merve Bodur (MIE) studied at Bogazici University in Turkey, as well as the University of Wisconsin–Madison, where she received her PhD. She conducted post-doctoral research at Georgia Institute of Technology. Her research focuses on new mathematical methods and big data analytics to optimize complex processes, including staffing, decision making and resource allocation.

Professor Jennifer Farmer (ChemE) is a teaching-stream faculty member who received her PhD in chemistry from York University. She will bring her expertise in synthetic and organometallic chemistry to undergraduate courses.

Professor Naomi Matsuura (MSE, IBBME) completed her PhD in the Department of Materials Science & Engineering at U of T and worked five years as a researcher at Sunnybrook Health Sciences Centre. Her research focuses on the application of nanotechnology, including injectable nanoparticles used as imaging agents, to the diagnosis and treatment of cancer.

Professor Alison Olechowski (MIE, ILead) completed her undergraduate studies at Queen's University and her PhD at the Massachusetts Institute of Technology (MIT). She uses a systems engineering approach to develop improved methods for corporate processes such as product development and risk management. As a teaching-stream faculty member, Professor Olechowski will share these useful tools with future engineers to enhance their leadership capabilities.

Professor Ira Daniel Posen (CivE) studied at Princeton University and Carnegie Mellon University, where he received his PhD in Engineering and Public Policy. He specializes in greenhouse gas emissions in the chemical industry, including assessing the effects of bio-based products using life-cycle analysis and examining the impact of renewable fuel standards on emissions.

Professor Shoshanna Saxe (CivE) studied at McGill University, MIT and the University of Cambridge, where she completed her PhD. She is an expert on public transit, in particular the impact of public infrastructure investments on society and the environment.

Professor Vahid Sarhangian (MIE) completed his PhD at U of T's Rotman School of Management and conducted postdoctoral research at Columbia Business School. He specializes in operations research, including optimizing the storage and delivery of blood products and other perishable commodities.

Professor Patricia Sheridan (ILead) received her PhD from the Collaborative Program in Engineering Education at U of T Engineering. She has developed novel tools to teach and evaluate team effectiveness and leadership competencies in undergraduate engineering courses.

Professor Hamid Timorabadi (ECE) completed his PhD in the Department of Electrical and Computer Engineering at U of T. He is a teaching-stream faculty member who specializes in lab-based courses relating to power electronics and computer organization.

Professor Marianne Touchie (CivE, MIE) completed her PhD in the Department of Civil Engineering at U of T and has worked for the Toronto Atmospheric Fund. Her research focuses on improving the energy performance and indoor environmental quality of existing buildings through comprehensive retrofits.

Professor Chirag Variawa (First Year Program) received his PhD from the Department of Mechanical & Industrial Engineering at U of T. He is a teaching-stream faculty member who applies artificial intelligence, computational linguistics, and neuroscience to improve the design of engineering learning environments.

Diversity in Engineering and Leadership

We have made significant progress since 2006, a time when our Faculty had no women in academic leadership positions. Today women engineers lead many of our academic units and our multidisciplinary research centres and institutes. They also hold senior leadership positions of significant responsibility at the University level.

Dean Cristina Amon (MIE) has led the Faculty of Applied Science & Engineering since 2006. She holds the Alumni Chair in Bioengineering and has been inducted into the Canadian Academy of Engineering, the Spanish Royal Academy, the Royal Society of Canada and the U.S. National Academy of Engineering. She has received the Achievement Award from the Society of Women Engineers, and in 2012 was among Canada's 25 Most Influential Women. In 2015 she received the Ontario Professional Engineers Gold Medal, the organization's highest honour.

Professor Aimy Bazylak (MIE) is the Canada Research Chair in Thermofluidics for Clean Energy and Director of the Institute for Sustainable Energy. This multidisciplinary institute brings together researchers, students, and educators from across the University, together with partners from industry and government, to increase energy efficiency and reduce the environmental impact of energy use and conversion.

Distinguished Professor Yu-Ling Cheng (ChemE) is Director of the Centre for Global Engineering. The Centre brings together researchers and students to tackle some of the world's most critical challenges, such as sanitation, alternative energy, drinking water and global health. Professor Cheng has also served as Chair of Engineering Science (2000–2005), Acting Chair of the Department of Chemical Engineering & Applied Chemistry (2006), Speaker of Faculty Council (2007–2010) and Acting Dean of the Faculty of Applied Science & Engineering (2012 and 2013).

Professor Elizabeth Edwards (ChemE) is the Canada Research Chair in Anaerobic Biotechnology. She heads both BioZone, a centre for applied bioengineering at U of T Engineering, and the Industrial Biocatalysis Network, which explores new methods of using enzymes to produce environmentally friendly chemicals, plastics and other products and includes researchers from the University of British Columbia, Concordia University and several industry partners.

Professor Deepa Kundur (ECE) is Director of the Centre for Power & Information and will become Chair of the Division of Engineering Science in January 2017. She is a leading expert on issues at the intersection of cybersecurity, signal processing and complex dynamical networks, including smart grid technologies that can increase the sustainability of our energy supply.

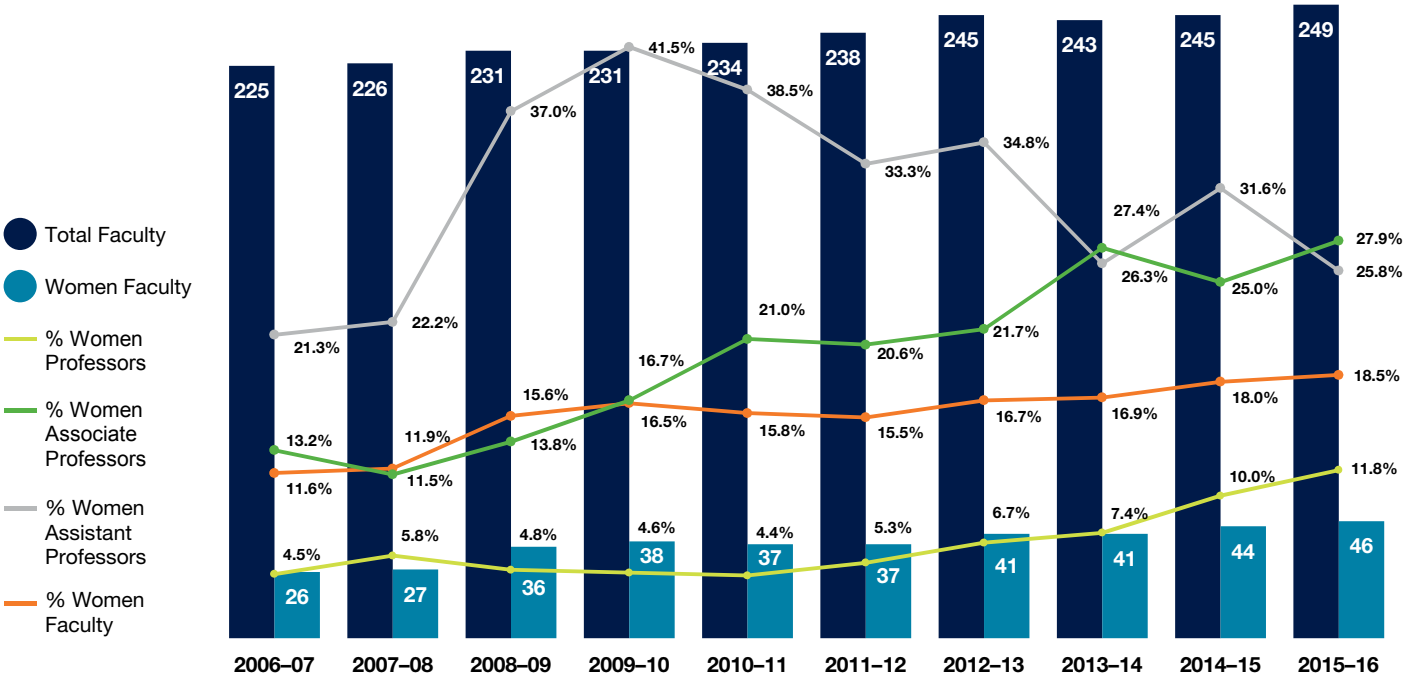
Professor Goldie Nejat (MIE) is the Canada Research Chair in Robots for Society and Director of the Institute for Robotics and Mechatronics, which is increasing cross-disciplinary research and commercialization in these fields.

Professor Susan McCahan (MIE), who served as Vice-Dean, Undergraduate (2011-2015) and Chair First Year (2006-2011), is now championing the University's efforts to reimagine undergraduate learning as Vice-Provost, Innovations in Undergraduate Education.

As U of T President Meric Gertler's Senior Advisor on Science and Engineering Engagement, **University Professor Molly Shoichet** (ChemE, IBBME) is raising public awareness of and engagement in STEM research at U of T. Her outstanding work in this area was recognized with the 2015 Fleming Medal and Citation from the Royal Canadian Institute.

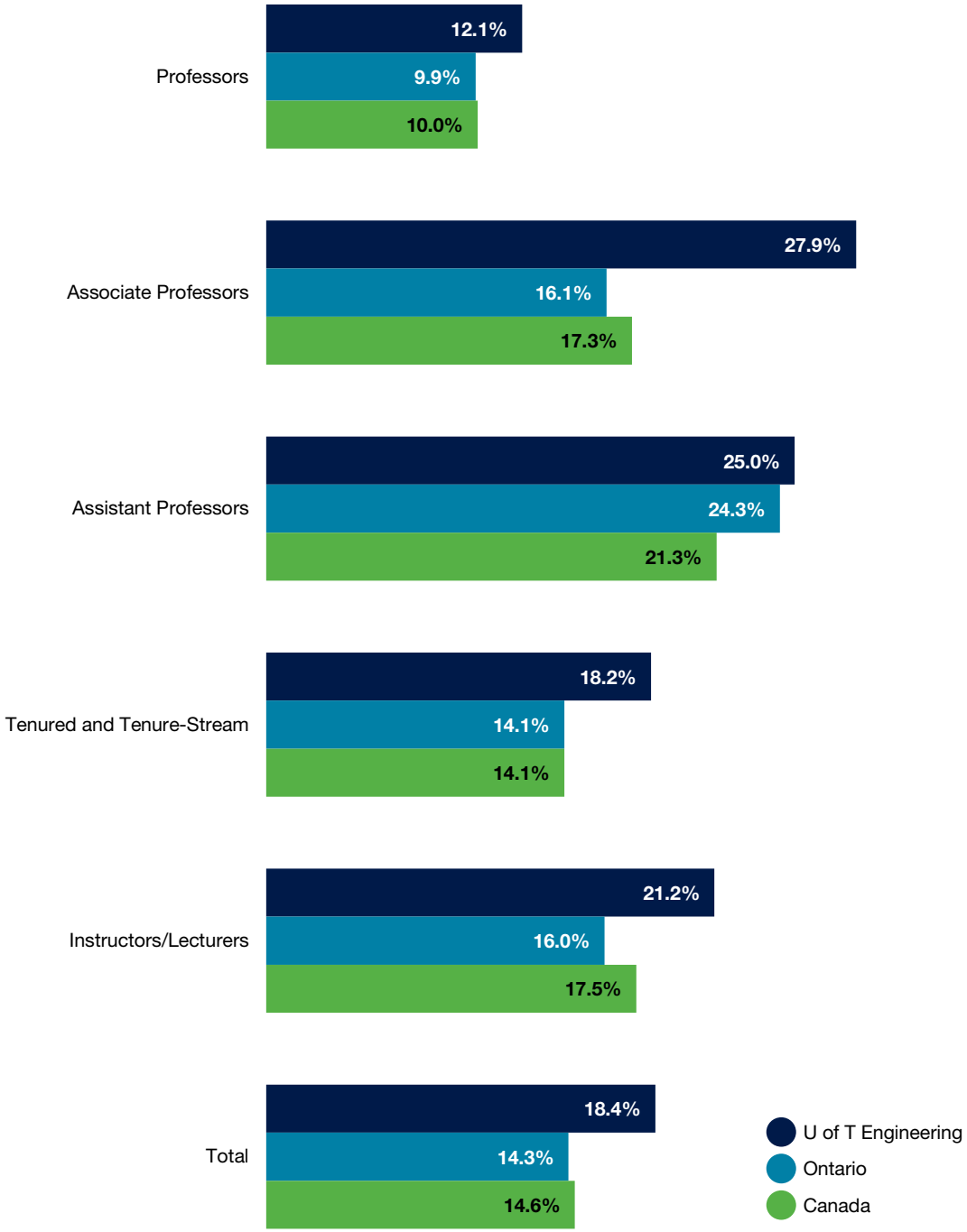
Professor Jean Zu (MIE) has served as the Chair of the Department of Mechanical & Industrial Engineering since 2009, having previously served as Associate Chair of Research. She was president of the Canadian Society for Mechanical Engineering from 2006–2008 and president of the Engineering Institute of Canada (EIC) from 2012–2014.

Figure 10.3 **Total Number of Faculty with Percentage of Women, 2006–2007 to 2015–2016**



Note 10.3: Data for this figure reflects faculty headcount as of July 1, 2016. Tenured, tenure-stream and teaching-stream professors are included.

Figure 10.4 **Percentage of Women Faculty at U of T Engineering Compared with Women Faculty in Ontario and Canadian Engineering Faculties, November 2015**



Next Steps

Diversity is a fundamental value of U of T Engineering, and we are committed to ensuring that the engineering profession reflects the population it serves. As a Faculty, we are developing a survey that will allow us to better understand the ethnicity, gender and sexual orientation, religion, age, disability, legal status and socio-economic background of our faculty, students and staff. The survey, designed by the Community Affairs & Gender Issues Committee, will help us assess how Faculty policies and practices support all members of our community, and make appropriate changes to strengthen this support. Other universities, such as the University of California, Los Angeles, Texas A&M University and the University of Maryland, have used diversity climate surveys to develop and implement policies to enhance diversity among their students, faculty and staff.

Note 10.4: Data in this figure comes from Engineers Canada. Counts are based on full-time equivalent (FTE) faculty as of November 15, 2015.

Diversity: Selected Highlights

Engaging Indigenous Youth in STEM

In May 2016, a team of U of T volunteers — including engineering student Yonatan Lipsitz (IBBME PhD candidate) — partnered with Sandy Lake First Nation in Northern Ontario to deliver a series of workshops aimed at reducing the high rates of Type II diabetes in the community. Topics included healthy meal planning, food composition and local gardening. Both children and adults in the community also took part in science and engineering activities, including learning about the night sky in an astronomy workshop. The project has been running for five years and is delivered through Let's Talk Science, a national organization that connects graduate students and youth in science, technology, engineering and math (STEM) activities.

In summer 2016, Rachel Mandel (Year 3 MIE) was one of 12 students from across Canada who were selected to deliver science, technology, engineering and math (STEM) workshops through the National Indigenous Youth in STEM (InSTEM) program. Developed and run by Actua, a national STEM charity, InSTEM is a customized, community-based approach to engaging First Nations, Métis, and Inuit youth in locally and culturally relevant STEM education programs. Mandel and her teammates travelled more than 8,000 kilometres, visiting Indigenous communities in Nunavut — Igloolik, Arctic Bay, Kimmirut, Hall Beach, Cape Dorset and Resolute Bay — as well as the Six Nations of the Grand River in Ontario. The workshops covered a diverse range of topics, from Arctic ecology to computer programming to the use of unmanned aerial vehicles in the mining industry.

Infrastructure Engineering in Remote First Nations Communities in Ontario

Starting in fall 2016, MEng students will be offered a new course in Infrastructure Engineering in Remote First Nations Communities in Ontario. We also struck a committee that will serve as an inclusive forum for discussion to ensure a welcoming and supportive atmosphere for Indigenous students, faculty, staff and communities.

New Godiva's Hymn Verses Celebrate Diversity in Engineering

Women in leadership, the impact of engineering on the world and Skule™ spirit were the themes of three new verses that took the top prizes in the Godiva's Hymn contest, which were announced at Cannonball 1T6, held in January 2016. Organized by the Engineering Society, the contest challenged the U of T Engineering community to create lyrics to this traditional engineering song that better convey the diversity and vibrancy of engineering in the 21st century. Tania Albarghouthi (Year 3 ECE) wrote the winning entry:

> *I came across a girl whose skin was glazed a purple hue,*
> *Her aura proud, her spirit loud, her words were strong and true,*
> *She led a group of hundreds who were chanting far and near,*
> *And in my mind, I had no doubts — she led the engineers!*

WISE Conference Highlights Professional and Personal Development

More than 250 delegates from universities across Ontario gathered in Toronto in January 2016 for the fourth annual Women in Science and Engineering (WISE) national conference. The program covered both professional and personal development topics, such as machine learning, how to land your dream job and finding the company culture that best fits your strengths. Guest speakers included leaders from companies ranging from startups such as NanoLeaf to multinational corporations such as IBM. U of T's WISE chapter was revitalized in 2012, with a mission to "support and empower women to achieve their full potential as engineers, scientists, and leaders." In addition to the national conference, WISE also runs mentoring programs, networking events and community outreach initiatives.

U of T Engineering Observes Pink Shirt Day

Students, staff and faculty gathered in the Sandford Fleming atrium on Feb. 24, 2016 to observe Pink Shirt Day. The annual event, which aims to end bullying, started after students at a Nova Scotia high school wore pink shirts to support a boy who had been bullied for wearing a pink shirt. Members of the U of T Engineering community posted photos of themselves on social media using the hashtag #pinkskule.

U of T Joins Diversity Initiative

U of T Engineering has joined more than 90 North American engineering schools that are leading a transformative movement to increase diversity in engineering. In a letter shared in August 2015 by the White House in Washington D.C. as part of the its first Demo Day, U of T and peer institutions committed to recruit women and underrepresented minorities to its student bodies and as faculty members, as well as foster a culture of inclusivity in the engineering profession. Released as part of the American Society for Engineering Education's Year of Action in Diversity, the letter outlines four actions that each participating school has committed to implement, including developing a diversity plan and conducting pre-university outreach programs.

11

Financial and Physical Resources

Strategic oversight of our physical and financial resources underpin our world-class research and educational programs. Total revenue in 2015–2016 grew by 6.3 per cent over the previous year, driven by higher international student enrolment, while our net revenue increased by 7.8 per cent. Growing revenue, combined with careful budgeting and fiscal management, enabled us to continue infrastructure upgrades as well as to invest in new initiatives and the further development of reserves for planned future priorities and contingencies.

The Dean's Strategic Fund (DSF) provides seed funding for projects that advance the goals of the Academic Plan, but which may not otherwise get started. These include research collaborations that bring experts together across disciplines to address major societal challenges, as well as initiatives to enhance the student experience, from improvements to teaching labs and fabrication spaces to new experiential learning programs. In 2016, we committed $7.2 million through the DSF for a number of initiatives that will be implemented over the next three years.

The Centre for Engineering Innovation & Entrepreneurship (CEIE), scheduled to open in 2017, is the most significant capital project the Faculty has undertaken in recent years. The CEIE will set a new standard for engineering education and research while providing a home for multidisciplinary research institutes such as the Centre for Global Engineering and the Institute for Sustainable Energy, and will contain Technology Enhanced Active Learning classrooms, prototyping and fabrication facilities, design/meet rooms and dedicated space for student clubs and teams. It will serve as a vibrant hub and enable us to drive innovation, facilitate entrepreneurial activities and cultivate global engineering leaders.

This year we completed the $10-million laboratory for the Translational Biology and Engineering Program (TBEP) in the MaRS Discovery District West Tower. TBEP is part of the Ted Rogers Centre for Heart Research, and brings together faculty and students from U of T Engineering, Dentistry and Medicine to advance heart research, diagnostics, and regeneration using a comprehensive approach that includes systems and developmental biology, technology innovation and clinical translation.

We also created the Dean's Infrastructure Improvement Fund, which enables upgrades to large-scale teaching and research laboratories and general facility renovations that further improve the experience of our students.

Total Revenue and Central Costs

The Faculty's total revenue and associated costs are reflected in Figures 11.1 and 11.2. Revenue in 2015–2016 grew to $210.1 million, an increase of 6.3 per cent over 2014–2015, with a compound annual growth rate of 6.5 per cent since 2006–2007.

Total central costs rose to $94.0 million, a 4.6 per cent increase over 2014–2015, with a compound annual growth rate of 5.3 per cent since 2006–2007. Central costs are composed of the student aid levy, university fund contribution and university-wide costs, which experienced year-over-year increases of 3.4 per cent, 3.1 per cent and 5.2 per cent respectively (Figures 11.2 and 11.3).

The rise in our student aid levy is driven by our commitment to provide need-based assistance. U of T's Student Access Guarantee makes this goal clear: "No student offered admission to a program at the University of Toronto should be unable to enter or complete the program due to lack of financial means." Student aid ensures we continue to attract the very best students regardless of their financial situation.

University-wide costs, which include caretaking, utilities, human resources, student services, information technology, central library, advancement and research services, to name a few, also increased. Factors included: development of a new student information system; improved wireless access across campus; enhancement of central library collections; and repeated higher pension fund deficit obligations brought about by a volatile investment environment.

As a result, net revenue increased by 7.8 per cent to $116.1 million year-over-year, with a compound annual growth rate of 7.6 per cent since 2006–2007.

Figure 11.1 **Total Revenue, 2006–2007 to 2015–2016**

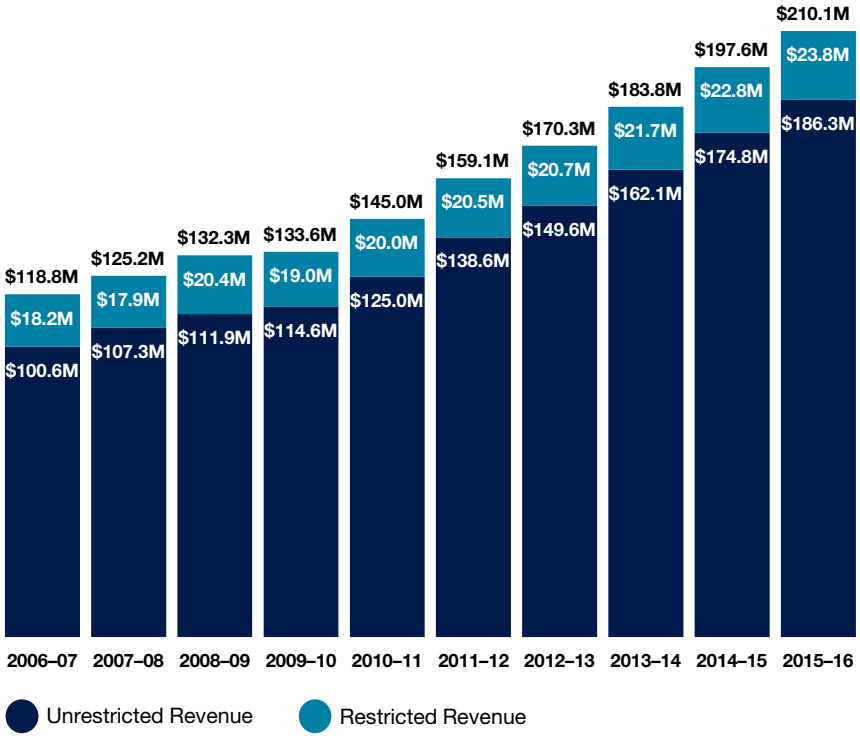
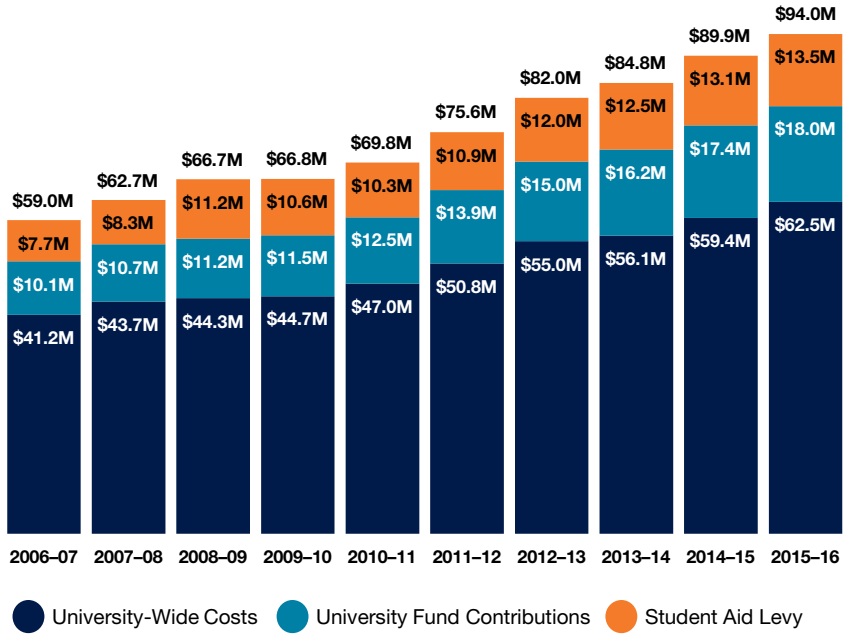


Figure 11.2 **Total Central Costs, 2006–2007 to 2015–2016**



Data in this chapter are presented by fiscal year (May to April). Selected projects were completed or begun between September 2015 and July 2016.

Figure 11.3 **Budget Data, 2006–2007 to 2015–2016**

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Total Revenue	**$118,826,327**	**$125,233,418**	**$132,333,400**	**$133,571,789**	**$144,976,282**	**$159,081,170**	**$170,342,629**	**$183,785,352**	**$197,570,871**	**$210,065,441**
Unrestricted Revenue	$100,663,690	$107,347,671	$111,937,605	$114,602,697	$124,966,518	$138,597,605	$149,615,656	$162,048,175	$174,819,446	$186,298,686
Restricted Revenue	$18,162,637	$17,885,747	$20,395,795	$18,969,092	$20,009,764	$20,483,566	$20,726,973	$21,737,177	$22,751,425	$23,766,755
Total Central Costs	**$58,976,711**	**$62,755,042**	**$66,667,514**	**$66,768,403**	**$69,837,572**	**$75,536,585**	**$81,984,923**	**$84,796,193**	**$89,927,727**	**$93,988,403**
University-Wide Costs	$41,180,986	$43,698,011	$44,307,203	$44,693,620	$47,027,056	$50,817,454	$55,028,273	$56,089,556	$59,390,462	$62,461,112
University Fund Contributions	$10,066,369	$10,734,767	$11,193,761	$11,460,270	$12,496,652	$13,859,760	$14,961,566	$16,167,220	$17,443,377	$17,985,353
Student Aid Levy	$7,729,356	$8,322,264	$11,166,550	$10,614,513	$10,313,864	$10,859,371	$11,995,084	$12,539,417	$13,093,888	$13,541,938
Net Revenue	**$59,849,616**	**$62,478,376**	**$65,665,886**	**$66,803,386**	**$75,138,710**	**$83,544,584**	**$88,357,706**	**$98,989,159**	**$107,643,144**	**$116,077,038**

Budget Overview

Our revenue sources, attributed central costs and budget breakdown for 2015–2016 are shown in Figures 11.4, 11.5 and 11.6, respectively. Revenues are up 6.3 per cent year-over-year, driven by higher student enrolment, rising relative enrolments of international undergraduate students and annual tuition increases. Government grant revenues have remained relatively stagnant as the grant per domestic student has not changed for a number of years.

The ability to consistently grow net revenue at the Faculty level enables us to pursue renewal objectives, including major strategic initiatives such as the Centre for Engineering Innovation & Entrepreneurship (CEIE). Further prudent budgeting and fiscal management across the Faculty has allowed us to fund reserves to meet future commitments, upgrade existing classrooms and laboratories and invest in Dean's Strategic Fund (DSF) initiatives.

Figure 11.4 **Revenue Sources, 2015–2016**

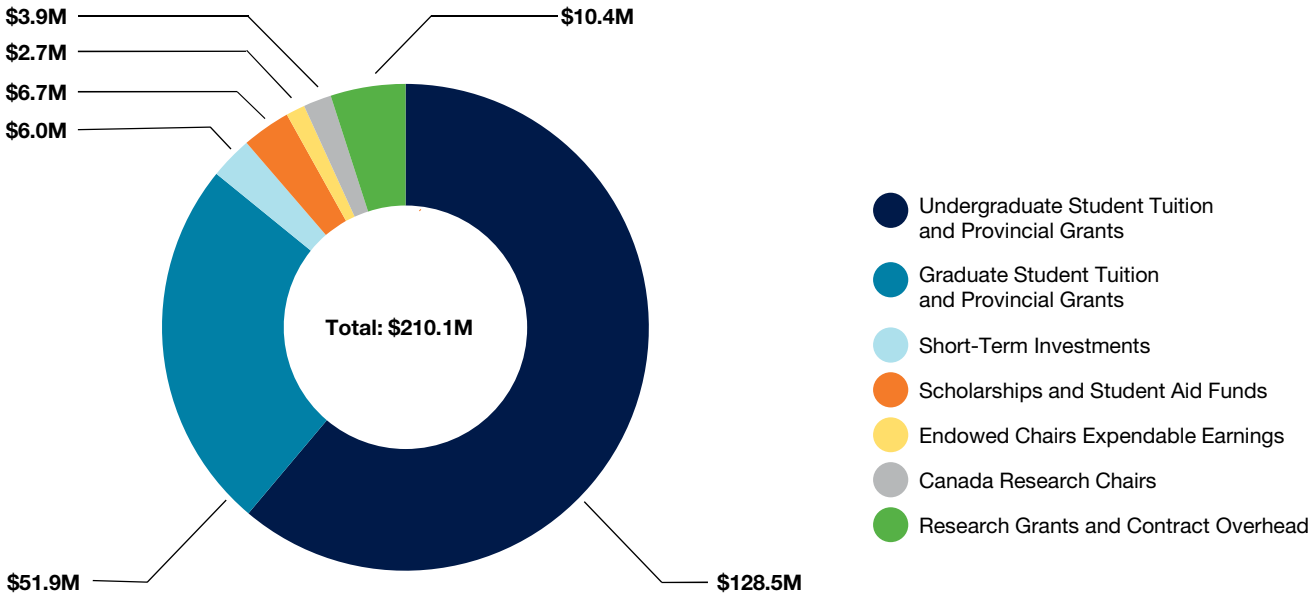


Figure 11.5 **Revenue Distribution, 2015–2016**

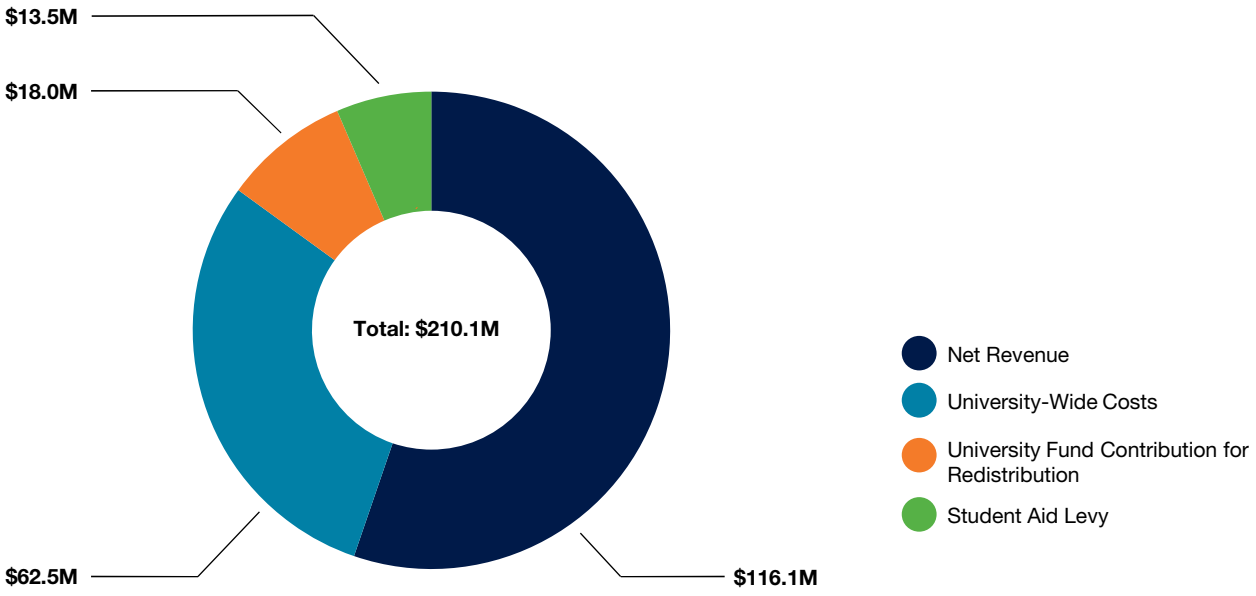
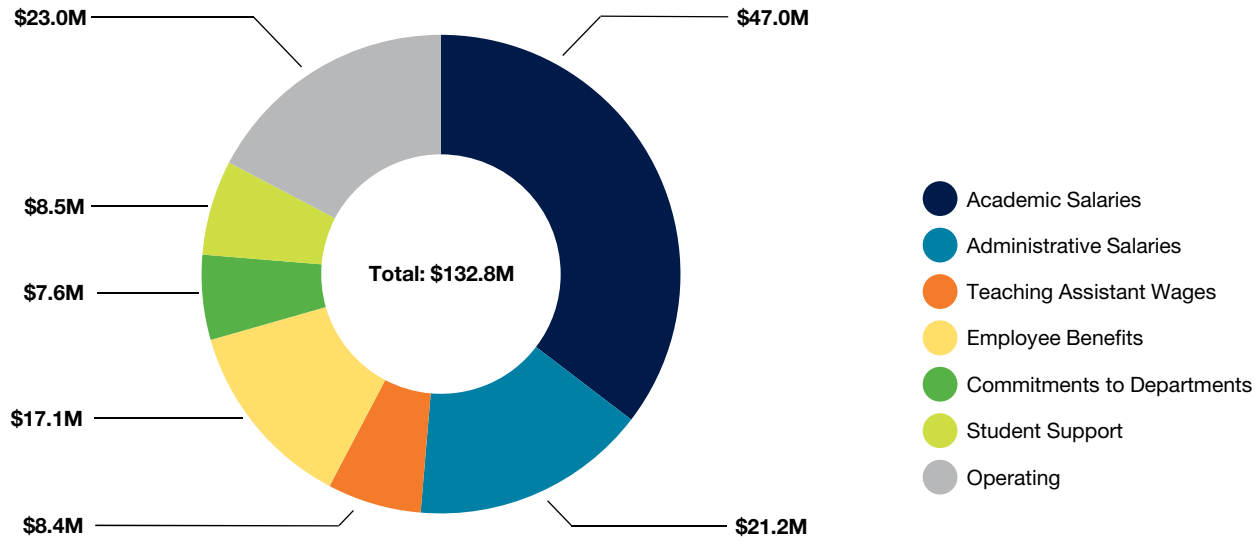


Figure 11.6 **Total Operating Budget: Breakdown by Expense, 2015–2016 (net of central university costs)**



Dean's Strategic Fund

The Dean's Strategic Fund (DSF) provides seed funding for initiatives that will have a broad impact within the Faculty.

In 2015–2016, the DSF committed $7.2 million to support 15 new projects designed to further the goals of the Faculty's Academic Plan over the next three years. These projects included:

Public Health Diagnostics Initiative (PHDi)

This project will create a multidisciplinary and cross-Faculty network of investigators focused on creating low-cost, easy-to-use diagnostic systems to detect toxins, pathogens or pollutants in air, water and food. These systems are especially important in developing countries, where the inability to monitor safety leaves the general population at risk for illness or disease. The project brings together researchers from U of T Engineering, the Dalla Lana School of Public Health and the Canadian Center for World Hunger Research.

The Entrepreneurship Hatchery Phase 1 and 2

The Entrepreneurship Hatchery's mission is to provide resources to launch and support student startups within the Faculty of Applied Science & Engineering and the University of Toronto as a whole. This is done through workshops that promote entrepreneurship — including the weekly Idea Markets — and a four-month summer program where teams work to build a minimum viable product. Throughout the process, Hatchery teams receive advice from mentors on how to refine their business plans and pitch their ideas to potential clients and investors.

The DSF will support continued improvements to the existing model, as well as a new program dedicated to the incubation of graduate-level, research-driven startups. Called Hatchery Phase 2, the new program will support teams of graduate students and faculty for longer periods of time in order to help them successfully commercialize their engineering solutions.

Expansion of MIE Machine shop

U of T Engineering is home to more than 80 student clubs and design teams, as well as a variety of design courses, each of which could benefit from more space for fabrication. By expanding the MIE student machine shop in MC78 in terms of both its physical capacity and hours of operation, we enable it to be opened up to students from all departments.

Expansion of the physical resources includes an upgrade to the floor, refurbishment of a lathe, re-allotment of space to accommodate the increased student numbers and installation of new safety systems. Supervision of the additional students and opening on Saturdays will require a new professional machinist. The DSF will support these expenses for a three-year period, after which time an appropriate fee schedule will be developed for individual Engineering Departments and users to cover continued access.

Infrastructure and Facilities

Figure 11.7 Summary of Buildings Occupied by the Faculty of Applied Science & Engineering, 2015–2016

Code	Building	Office of the Dean	EngSci	UTIAS	ChemE	CivE & MinE	ECE	IBBME	MIE	MSE	Total NASMs
AS	**Aerospace (Downsview)**			5,294							5,294
BA	**Bahen Centre**	1,113	575		67		5,741		1,375		8,871
DC	**CCBR**				667			889			1,556
EA	**Eng Annex**	237					946		91		1,274
EL	**Electrometal**									149	149
FI	**Fields Institute**	340									340
GB	**Galbraith**	1,667				4,869	4,174				10,710
HA	**Haultain**				198	110			639	721	1,668
	MaRS West Tower						132	791	183		1,110
MB	**Mining**					1,205		1,379	1,885	830	5,299
MC	**Mech Eng**	63							5,391		5,454
PT	**D.L. Pratt**						1,330			1,491	2,821
RS	**Rosebrugh**							814	2,096		2,910
SF	**Sandford Fleming**	766		692		1,559	3,556				6,573
WB	**Wallberg**	375			8,135		130			1,327	9,967
RM	**256 McCaul**	528									528
	Total Area	**5,089**	**575**	**5,986**	**9,067**	**7,743**	**16,013**	**3,873**	**11,660**	**4,518**	**64,524**
		64,524 NASMs									

Projects Completed — By Building

Bahen Centre

Student Study Seating

Building on the work completed in 2014–2015, we increased the available seating in the Bahen Centre where students can study and complete assignments between classes. The new seating can accommodate an additional 65 students and is part of our commitment to improve the student experience at U of T Engineering.

Fields Institute

Relocation of HR Group

To make more efficient use of space, we relocated the Faculty's human resources group to the Fields Institute, where it shares space with the Engineering Career Centre.

Galbraith Building

Building Accessibility and Elevators

To enhance the accessibility of our facilities, we installed lift systems at the main entrance steps of 35 St. George St. and from the main lobby to the first floor corridor near the Registrar's Office. Both passenger elevators were refurbished and modernized by Facilities & Services.

Electrical Energy Systems Lab

This renovation expands the range of courses the lab can support and improves student safety. We completed the second phase of construction, which involved replacing student test stations throughout the lab and running new wiring from each station to the electrical room through the existing floor trench/conduit system.

Nano for Energy Lab Renovation — Galbraith 445

This project creates a new research laboratory by converting a former undergraduate teaching laboratory to a clean, high-tech space. This involved installing four fume hoods, a wet bench and a dedicated HVAC system.

Haultain Building

Student Club Space Renovation

To provide student groups such as the Baja and Formula-SAE teams with improved space to design, build and test their vehicles, we upgraded room 102 in the Haultain Building. The upgrades included the removal of suspended ceiling, installation of new work benches & storage units, a new articulated-arm fume extraction canopy, a new chain hoist, repainting and floor refinishing.

Lassonde Mining Building

MIE Student Study/Conferencing Room

To create a new student study/conferencing facility, we renovated room 71 in the Lassonde Mining Building.

MaRS

Translational Biology & Engineering Program Lab

The Translational Biology & Engineering Program (TBEP) is part of the Ted Rogers Centre for Heart Research, and brings together leading experts in engineering and medicine to advance discoveries and accelerate new treatments for cardiovascular disease. We built a $10 million central research lab and surrounding offices and meeting facilities on the 14th floor of MaRS Discovery District West Tower to house TBEP.

Mechanical Engineering Building

Student Machine Shop Expansion

The expansion of the student machine shop allows more students from across the entire Faculty to fabricate parts and prototypes, either for their courses or for student design clubs and teams. The expansion includes an upgrade to the floor, refurbishment of a lathe, re-allotment of space to accommodate the increased student numbers, and installation of new safety systems. We have hired additional staff to increase opening hours.

Wallberg Building

Chemical Engineering Operations Lab Renovations

To house additional experiments and improve safety, we renovated the two-level Operations Lab in rooms 25/125.

Video-Conferencing Pilot Project

To improve collaboration between our faculty members and collaborators, we installed a pilot video-conferencing system in room 407 for evaluation.

Projects Underway — By Building

Centre for Engineering Innovation & Entrepreneurship (CEIE)

Construction Progress

We have made significant progress on this new building since the official groundbreaking in June 2015. Workers have completed the bulk excavation and installed a de-watering system and connected temporary power. They have drilled 123 caissons down to the bedrock to create the building's foundation, and built a construction crane to enable the construction of upper layers. Construction of the concrete walls and columns for Lower Level II is underway. We have also begun the process of designing the interior, including furniture layout and selection, signage (wayfinding and donor recognition) and audio-visual systems. *For more information about the CEIE please see the introductory section.*

D.L. Pratt Building

Room 162 Lab Renovation

To accommodate new research equipment for several faculty in the area of extractive metallurgy, this MSE research lab space has been re-designed. Construction will start in the fall.

Galbraith Building

Room 412 Lab Renovation

We began the design phase for this project will convert a tutorial room into a wet research lab for water-related research in CivE.

Gull Lake

Bunkhouse Project

A new bunkhouse will accommodate 68 students. We have completed a design which can now be used to assist with fundraising for this CivE project.

Lassonde Mining Building

IBBME Undergraduate Teaching Lab Expansion

To enhance the student experience, we started the pre-design phase for a project that will convert room 322 in the Lassonde Mining Building from a research lab to an undergraduate teaching lab.

Office Renovations

This renovation of the first-floor, west-wing office area will accommodate additional graduate student offices for the Lassonde Mineral Engineering program. We began a schematic design for this project.

Mechanical Engineering Building

Lobby Renovations

This renovation will expand the lobby area of the Mechanical Engineering Building. We have initiated a feasibility study.

MC 402 Renovation

In summer 2016, we began renovations to create M-Space, a new instructional/fabrication facility.

University of Toronto Institute for Aerospace Studies

Gas Turbine Combustion Research Lab Renovation

This new research lab will be created in tandem with the associated combustion wind tunnel. We have begun preparing a design to send out to tender.

Room 194 Lecture Room

To improve research capabilities, we started the design of a small-scale visualization facility and lecture room for computational modelling.

Wallberg Building

Fume Hood Project

To improve sustainability, we initiated a feasibility study to optimize the energy efficiency of the fume hoods throughout the building.

Space Audits

We conduct regular audits to inform our infrastructure needs and the most efficient use of space. Over the past year, we made progress on the following audits and reports:

- A space audit of undergraduate teaching labs (Final report expected by December 2016)
- A report by the Working Group on makerspaces on the status of machine shops and other fabrications space within the Faculty (Final recommendations expected by November 2016)
- A safety audit of all common and study rooms
- A project planning report for the CivE space on the first-floor, west wing, in Lassonde Mining Building
- A project planning report for the Gull Lake Bunkhouse Project

LIFT Initiative

We also worked with other Faculties on the Lab Innovation for Toronto (LIFT) project, which funds infrastructure upgrades across the University. In July 2016, we received $31.6 million to renovate 89 laboratory spaces, benefitting more than 330 professors, graduate students and undergraduate students.

Glossary

Faculty of Applied Science & Engineering Academic Area Terms

Academic Area	For the purpose of this annual report, Academic Area refers to the following departments, divisions and institutes: UTIAS, IBBME, ChemE, CivE, ECE, EngSci, MIE and MSE. While General First Year is not an academic unit, it is also included as an academic area in specific contexts Chapter 1: Undergraduate Studies.
ChemE	Department of Chemical Engineering & Applied Chemistry Graduates who studied the discipline of Chemical Engineering are also designated as ChemE.
CivE	Department of Civil Engineering Graduates who studied the discipline of Civil Engineering are also designated as CivE.
CompE	Graduates of The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE) who studied the discipline of Computer Engineering.
ElecE	Graduates of The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE) who studied the discipline of Electrical Engineering.
ECE	The Edward S. Rogers Sr. Department of Electrical & Computer Engineering Graduates of Electrical Engineering are designated as ElecE; graduates of Computer Engineering are designated as CompE.
EngSci	Division of Engineering Science Graduates of this Division are also designated as EngSci.
IBBME	Institute of Biomaterials & Biomedical Engineering Graduates who studied the discipline of Biomedical Engineering are referred to as BioMedE.
IndE	Graduates of the Department of Mechanical & Industrial Engineering (MIE) who studied the discipline of Industrial Engineering.
MechE	Graduates of the Department of Mechanical & Industrial Engineering (MIE) who studied the discipline of Mechanical Engineering.
MIE	Department of Mechanical & Industrial Engineering Graduates of Mechanical Engineering are designated as MechE; graduates of Industrial Engineering are designated as IndE.
MinE	Graduates from the Department of Civil Engineering (CivE) who studied the discipline of Mineral Engineering.
MSE	Department of Materials Science & Engineering Graduates who studied the discipline of Materials Engineering are also designated as MSE.
General First Year	General first-year undergraduate studies in Engineering, formerly known as TrackOne. Upon successful completion of General First Year, students choose from one of the Engineering undergraduate programs, excluding Engineering Science.
UTIAS	University of Toronto Institute for Aerospace Studies Graduates who studied the discipline of Aerospace Engineering within this Institute are designated as AeroE.

Additional Terms

AAAS	American Association for the Advancement of Science
AAU	Thomson Reuters Association of American Universities
ARWU	Shanghai Jiao Tong Academic Ranking of World Universities
ASEE	American Society for Engineering Education
BASc	Bachelor of Applied Science
BizSkule	Alumni speaker series
CCR	Co-Curricular Record
CEIE	Centre for Engineering Innovation & Entrepreneurship
CFI	Canada Foundation for Innovation
CGEN	Centre for Global Engineering
CHE	Centre for Healthcare Engineering
CHRP	Collaborative Health Research Projects
CIE	Centre for International Experience
CIHR	Canadian Institute of Health Research
CRC	Canada Research Chair
CREATE	NSERC Collaborative Research and Training Experience
DEEP	Da Vinci Engineering Enrichment Program
DSF	Dean's Strategic Fund
ECN	Engineering Communications Network
ECP	Engineering Communication Program
EDU	Extra-Departmental Unit
EIIP	Engineering Instructional Innovation Program
ELITE	Entrepreneurship, Leadership, Innovation & Technology in Engineering
EngEd	Engineering Education, graduate-level programs
eSIP	Engineering Summer Internship Program
ESOO	Engineering Student Outreach Office
ESROP	Engineering Science Research Opportunities Program
FTE	Full-time equivalent
GCC	Grand Challenges Canada
G-IFP	Graduate International Foundation Program
GLEE	Girls' Leadership in Engineering Experience
Graditude	Fundraising campaign for students
GTA	Greater Toronto Area
H-index	A measurement of both the productivity and impact of published work based on citations
HC	Headcount, or number of degree-seeking students
IEEE	Institute of Electrical and Electronics Engineers
IFP	International Foundation Program
ILead	Institute for Leadership Education in Engineering
IRC	Industrial Research Chair
ISE	Institute for Sustainable Energy
MASc	Master of Applied Science
MCP	Multidisciplinary Capstone Projects
MEng	Master of Engineering
MEngCEM	MEng in Cities Engineering & Management
MEng, SCFI	MEng program for the Stronach Centre for Innovation
MHSc	Master of Health Science (Clinical Engineering)
MFP	MasterCard Foundation Scholarship Program
MOOC	Massive Open Online Course
NASM	Net Assignable Square Metre
NCE	Networks of Centres of Excellence
NSERC	Natural Sciences and Engineering Research Council of Canada
NTU	National Taiwan University
OCCAM	Ontario Centre for Characterization of Advanced Materials
OGS	Ontario Graduate Scholarship

OISE	Ontario Institute for Studies in Education
ONWIE	Ontario Network of Women in Engineering
ORF	Ontario Research Fund
OSAP	Ontario Student Assistance Program
PASS	Peer-Assisted Study Sessions
PEY	Professional Experience Year internship program
PhD	Doctor of Philosophy
PPIT	Prospective Professors in Training Program
QS	QS World Rankings
RENEW	Remediation Action Network
SGS	University of Toronto School of Graduate Studies
Skule™	Refers to the U of T Engineering community
SSHRC	Social Sciences and Humanities Research Council
STEM	Science, Technology, Engineering and Mathematics
SwB	Science without Borders
TBEP	Translational Biology and Engineering Program
TEAL	Technology Enhanced Active Learning
THE	Times Higher Education–Thomson Reuters World University Ranking
TIAM	Toronto Institute for Advanced Manufacturing
TRCHR	Ted Rogers Centre for Heart Research
Tri-Council	Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC) and Social Sciences and Humanities Research Council (SSHRC)
U15	Group of 15 leading, research-intensive universities in Canada, including: University of Alberta, University of British Columbia, University of Calgary, Dalhousie University, Université Laval, University of Manitoba, McGill University, McMaster University, Université de Montréal, University of Ottawa, Queen's University, University of Saskatchewan, University of Toronto, University of Waterloo, Western University
UnERD	Undergraduate Engineering Research Day
UT-IMDI	University of Toronto Institute for Multidisciplinary Design & Innovation
UTAPS	University of Toronto Advanced Planning for Students
UTTRI	University of Toronto Transportation Research Institute
WISE	Women in Science & Engineering
YWIES	Young Women in Engineering Symposium

Appendices

Appendix A: Student Clubs and Teams

Below is a list of Engineering student clubs and teams, which is referenced in *Chapter 1: Undergraduate Studies*. Beyond the groups presented here, our students also participate in clubs and teams across U of T.

Arts

- Appassionata Music Group
- Skule™ Arts Festival
- Skule™ Orchestra
- Skule™ Stage Band
- Tales of Harmonia
- U of T Music Clubs Initiative

Athletics

- Skule™ Badminton Club
- U of T Engineering Iron Dragons
- U of T Ironsports Club

Community

- Bridges to Prosperity
- Engineers Without Borders – U of T Chapter
- Engineering World Health – U of T
- Pakistan Development Foundation
- Power to Change U of T
- Promise to Future Generations
- Students Fighting Cancer
- Student Research Teams
- Suits U
- Tetra Society
- Toronto Students for the Advancement of Aerospace (TSAA)
- TrackOne Mentorship Program
- Women in Science and Engineering

Cultural

- Arabs in Engineering
- Bangladeshi Engineering Students' Association
- Chinese Engineering Students' Association
- Indian Engineering Students' Association
- Indian Students' Society
- Malaysian Student Association of University of Toronto
- Muslim Students Association
- U of T Engineering Chinese Club
- University of Toronto Ismaili Students Association (ISA)
- U of T Mandarin Chinese Christian Fellowship

Design & Competition

- Blue Sky Solar Racing
- Global Engineering Design Association
- Human-Powered Vehicle Design Team
- Mechatronics Design Association
- Multidisciplinary Analytical Kinesthetic Education
- Project Holodeck
- Robotics for Space Exploration
- Seismic Design Team
- Spark Design Club
- Supermileage Team
- University of Toronto Aerospace Team
- U of T Baja Team
- U of T Biomod Team
- U of T Concrete Canoe Team
- U of T Concrete Toboggan Team
- U of T Destination Imagination
- U of T Formula SAE Racing Team
- U of T Robotics Association
- U of T Space Design Contest
- U of T Steel Bridge Team

Hobby & Special Interest

- Hacker Academy
- LeadingGreen
- Peer Wellness Group
- Skule™ Dance Club
- Skule™'s Got Talent
- Skule™ Improv
- U of T Emergency First Responders
- U of T Engineering Photography Club
- U of T Engineering Toastmasters
- UTFOLD
- UTTTC (University of Toronto Table Tennis Club)
- U of T Smash
- Skule™ Dev

Professional Development & Industry

- AIChemE
- American Society of Mechanical Engineers
- ASHRAE U of T
- Biomedical Engineering Students Association
- Canadian Association of Food Engineers – University of Toronto
- Canadian Electrical Contractors Association
- Canadian Society for Chemical Engineering
- Canadian Society for Mechanical Engineering
- Canadian Institute of Mining, Metallurgy and Petroleum – University of Toronto Chapter
- Club for Undergraduate Biomedical Engineering
- Digital Trinity Labs
- Galbraith Society
- Institute of Electrical and Electronics Engineers University of Toronto Student Branch
- Institute of Industrial Engineers Chapter 0889
- Institute of Transportation Engineers
- Materials Industry Club
- MIE Mentorship Program
- MechEngage
- National Society of Black Engineers
- Nsight Mentorship
- Nspire Innovation Network
- Materials Industry Club
- Rational Capital Investment Fund
- Society of Petroleum Engineers at the University of Toronto
- Sustainable Engineers Association
- TechXplore
- U of T Business Association
- U of T Consulting Association
- University of Toronto Energy Network
- University of Toronto Engineering Finance Association
- University of Toronto Ontario Water Works Association-Student Chapter
- UT Industry Insights
- Water Environment Association of Ontario Student Chapter

Appendix B: Outreach Programs

Between July 2015 and June 2016, we offered the following pre-university outreach programs, reaching more than 9,000 students from across Ontario, Canada and the world.

Program	Date	Total # of Participants	Female	Male	Audience
DEEP Summer Academy	July 5-August 1, 2015	472	142	330	Grades 9-12
DEEP Leadership Camp	July 5-August 1, 2015	57	14	43	Grades 10-12
Girls' Jr. DEEP	July 6-10, 2015	74	74	0	Grades 3-8
ENGage	July 6-10, 2015	68	34	34	Grades 3-8
Jr. DEEP	July 13-August 21, 2015	759	246	513	Grades 3-8
Go ENG Girl	October 17, 2015	104	104	0	Grades 7-10
Girls' Jr. DEEP Saturday Fall	October 24-November 7, 2015	73	73	0	Grades 3-8
Jr. DEEP Saturday Fall	November 14-28, 2015	71	19	52	Grades 3-8
High School Saturdays Fall	November 14-28, 2015	75	32	43	Grades 9-11
Girls' Jr. DEEP Saturday Winter	January 16-30, 2016	72	72	0	Grades 3-8
Jr. DEEP Saturday Winter	February 6-27, 2016	72	14	58	Grades 3-8
High School Saturdays Winter	February 6-27, 2016	75	20	55	Grades 9-11
DEEP Leadership at March Break	March 14-18, 2016	24	7	17	Grades 10-11
Jr. DEEP at March Break	March 14-18, 2016	72	24	48	Grades 3-8
In-School and On-Campus Workshops	May 11-June 10, 2016	5,774	2,887	2,887	Grades 3-8
Innovate U	May 13, 2016	1,400	700	700	Grades 3-8
Skule™ Kids	May 28, 2016	36	12	24	Grades 1-8
Total		**9,242**	**4,462**	**4,780**	

Appendix C: Time to Completion for Graduate Students

The following figures indicate the median time to completion for graduating cohorts in each master's and doctoral degree program by academic area for the past decade. Time to completion represents the number of years between a student's initial enrolment in a graduate program and meeting all the requirements for graduation. The data includes only terms in which a student is registered, excluding leaves, lapses and (in most cases) the term in which convocation occurs. Where a student is fast-tracked from the MASc into a PhD, the total time for both programs is counted. Distinguishing full-time (FT), extended full-time (ExtFT) and part-time (PT) MEng students provides greater clarity.

Figure C.1 **University of Toronto Institute for Aerospace Studies**
Time to Completion for Graduate Students, 2006–2007 to 2015–2016

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
PhD	4.5	5.2	5.3	6.0	7.0	4.7	5.3	5.3	5.7	6.3
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.0	2.0
MEng (FT)	1.3		1.3	1.2	1.3	1.3	1.0	1.0	1.0	1.0
MEng (Ext FT)									1.7	1.7
MEng (PT)	1.7	1.7	1.0	1.8			1.7	1.3	2.0	2.3

Figure C.2 **Institute of Biomaterials & Biomedical Engineering**
Time to Completion for Graduate Students, 2006–2007 to 2015–2016

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
PhD	5.2	3.3	4.3	4.3	6.0	5.7	5.0	5.0	6.0	5.7
MASc	2.3	2.0	2.2	2.0	2.0	2.0	2.0	2.0	2.3	2.0
MHSc (FT)	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Figure C.3 **Department of Chemical Engineering & Applied Chemistry**
Time to Completion for Graduate Students, 2006–2007 to 2015–2016

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
PhD	5.7	4.7	5.0	5.3	6.0	5.3	5.2	5.5	5.7	5.7
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3
MEng (FT)	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)									1.5	1.7
MEng (PT)	3.3	2.0	3.7	2.2	1.8	1.3	2.0	2.0	1.8	1.5

Figure C.4 Department of Civil Engineering
Time to Completion for Graduate Students, 2006–2007 to 2015–2016

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
PhD	4.8	4.7	5.0	5.0	5.3	5.3	5.3	5.0	5.3	5.3
MASc	2.3	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MEng (FT)	1.3	1.0	1.0	1.0	1.3	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)									1.3	1.7
MEng (PT)	1.8	1.7	1.7	2.0	2.3	1.8	2.0	2.0	1.7	2.0
MEngCEM (FT)									1.3	1.3

Figure C.5 The Edward S. Rogers Sr. Department of Electrical & Computer Engineering
Time to Completion for Graduate Students, 2006–2007 to 2015–2016

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
PhD	5.3	4.7	4.7	4.7	5.0	5.2	5.5	5.3	5.0	5.0
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3	2.0
MEng (FT)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)									1.3	1.3
MEng (PT)	2.0	2.0	2.0	3.0	2.7	2.0	2.2	2.0	2.0	2.0

Figure C.6 Department of Mechanical & Industrial Engineering
Time to Completion for Graduate Students, 2006–2007 to 2015–2016

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
PhD	4.5	4.7	4.7	4.0	4.7	5.0	5.7	5.0	4.8	5.0
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MEng (FT)	1.0	1.3	1.0	1.3	1.0	1.3	1.0	1.0	1.0	1.0
MEng (Ext FT)									1.7	1.7
MEng (PT)	2.0	2.3	2.3	2.3	2.0	2.0	2.0	2.0	2.0	1.7
MEngDM (PT)	2.7	2.2	3.3	2.7	2.3	2.7	2.5	2.7	2.3	3.5

Figure C.7 Department of Materials Science & Engineering
Time to Completion for Graduate Students, 2006–2007 to 2015–2016

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
PhD	5.8	5.3	4.0	5.3	6.0	6.3	5.7	4.7	5.3	5.5
MASc	2.0	2.0	1.7	2.0	2.0	2.0	2.0	2.3	2.0	2.0
MEng (FT)			1.5	1.7		0.8	1.0	1.0	1.0	1.0
MEng (Ext FT)									1.3	1.7
MEng (PT)	2.7		1.3	2.0	2.3	2.3	2.0	2.7	2.8	

Note: Based on Ontario Council of Graduate Studies (OCGS) data from ROSI. Data reflects median values based on the total number of terms in which a student is registered.

Appendix D: Research Chairs

Our Faculty is home to 77 research chairs held by 69 individual chairholders. The following list reflects five types of Chairs:

- **Canada Research Chair (CRC):** The Canadian Government invests $300M per year in two types of CRCs: 1) Tier 1 – renewable chair held for seven years; and 2) Tier 2 – held for five years and is eligible for renewal once.
- **Endowed Chair:** Fixed-term chairs created through donor support. Holders are of high distinction and typically tenured faculty.
- **Industrial Research Chair:** Jointly funded by NSERC and industry to help universities build on existing strengths or develop research capacity in areas of interest to industry.
- **U of T Distinguished Professor:** Designed to advance and recognize faculty with highly distinguished accomplishments. This Chair is limited to no more than three per cent of tenured faculty.
- **University Professor:** The highest possible rank at U of T. This title is awarded to a maximum of two per cent of tenured U of T faculty.

Figure D.1 Research Chairs, 2015–2016

Title	Chairholder	Sponsor	Tier	Dep't
Alumni Chair in Bioengineering	Cristina Amon	Endowed		MIE
Bahen/Tanenbaum Chair in Civil Engineering	Jeffrey Packer	Endowed		CivE
Bahen/Tanenbaum Chair in Civil Engineering	Michael Collins	Endowed		CivE
Bell Canada Chair in Multimedia	Kostas Plataniotis	Endowed		ECE
Bell University Labs Chair in Computer Engineering	Baochun Li	Endowed		ECE
Canada Research Chair in Advanced Catalysis for Sustainable Chemistry	Cathy Chin	NSERC	Tier 2	ChemE
Canada Research Chair in Anaerobic Biotechnology	Elizabeth Edwards	NSERC	Tier 1	ChemE
Canada Research Chair in Autonomous Space Robotics	Timothy Barfoot	NSERC	Tier 2	UTIAS
Canada Research Chair of Biotechnology	Warren Chan	NSERC	Tier 2	IBBME
Canada Research Chair in Cellular Hybrid Materials	Glenn Hibbard	NSERC	Tier 2	MSE
Canada Research Chair in Computational Modelling and Design Optimization Under Uncertainty	Prasanth Nair	NSERC	Tier 2	UTIAS
Canada Research Chair in Diffusion-Wave Sciences and Technologies	Andreas Mandelis	NSERC	Tier 1	MIE
Canada Research Chair in Environmental Engineering and Stable Isotopes	Elodie Passeport	NSERC	Tier 2	ChemE, CivE
Canada Research Chair in Freight Transportation and Logistics	Matthew Roorda	NSERC	Tier 2	CivE
Canada Research Chair in Fuel Cell Materials and Manufacturing	Olivera Kesler	NSERC	Tier 2	MIE
Canada Research Chair in Functional Cardiovascular Tissue Engineering	Milica Radisic	NSERC	Tier 2	IBBME, ChemE
Canada Research Chair in Human Factors and Transportation	Birsen Donmez	NSERC	Tier 2	MIE
Canada Research Chair in Information Processing and Machine Learning	Brendan Frey	NSERC	Tier 1	ECE
Canada Research Chair in Information Theory and Wireless Communications	Wei Yu	NSERC	Tier 1	ECE
Canada Research Chair in Integrated Photonic Devices	Joyce Poon	NSERC	Tier 2	ECE
Canada Research Chair in Micro and Nano Engineering Systems	Yu Sun	NSERC	Tier 2	MIE
Canada Research Chair in Microfluidics and Energy	David Sinton	NSERC	Tier 1	MIE
Canada Research Chair in Modelling of Electrical Interconnects	Piero Triverio	NSERC	Tier 2	ECE
Canada Research Chair in Nano- and Micro-Structured Electromagnetic Materials and Applications	George Eleftheriades	NSERC	Tier 1	ECE
Canada Research Chair in Nanotechnology	Ted Sargent	NSERC	Tier 1	ECE
Canada Research Chair in Network Information Theory	Ashish Khisti	NSERC	Tier 2	ECE
Canada Research Chair in Novel Optimization and Analytics in Health	Timothy Chan	NSERC	Tier 2	MIE
Canada Research Chair in Organic Optoelectronics	Zheng-Hong Liu	NSERC	Tier 1	MSE
Canada Research Chair in Robots for Society	Goldie Nejat	NSERC	Tier 2	MIE
Canada Research Chair in Secure and Reliable Computer Systems	David Lie	NSERC	Tier 2	ECE
Canada Research Chair in Seismic Resilience of Infrastructure	Constantin Christopoulos	NSERC	Tier 2	CivE
Canada Research Chair in Stem Cell Bioengineering	Peter Zandstra	NSERC	Tier 1	IBBME

Title	Chairholder	Sponsor	Tier	Dep't
Canada Research Chair in Thermofluidics for Clean Energy	Aimy Bazylak	NSERC	Tier 2	MIE
Canada Research Chair in Tissue Engineering	Molly Shoichet	NSERC	Tier 1	ChemE, IBBME
Celestica Chair in Materials for Microelectronics	Doug Perovic	Endowed		MSE
Chair in Information Engineering	Joseph Paradi	Endowed		MIE
Clarice Chalmers Chair of Engineering Design	Greg Jamieson	Endowed		MIE
Dusan and Anne Miklas Chair in Engineering Design	Paul Chow	Endowed		ECE
Edward S. Rogers Sr. Chair in Engineering	Brendan Frey	Endowed		ECE
Eugene V. Polistuk Chair in Electromagnetic Design	Costas Sarris	Endowed		ECE
Frank Dottori Chair in Pulp and Paper Engineering	Honghi Tran	Endowed		ChemE
Foundation CMG Industrial Research Chair in Fundamental Petroleum Rock Physics and Rock Mechanics	Giovanni Grasselli	Foundation CMG		CivE
Gerald R. Heffernan Chair in Materials Processing	Mansoor Barati	Endowed		MSE
J. Armand Bombardier Foundation Chair in Aerospace Flight	David Zingg	Endowed		UTIAS
L. Lau Chair in Electrical and Computer Engineering	Reza Iravani	Endowed		ECE
Michael E. Charles Chair in Chemical Engineering	Michael Sefton	Endowed		ChemE, IBBME
Nortel Institute Chair in Emerging Technology	J. Stewart Aitchison	Endowed		ECE
Nortel Institute Chair in Network Architecture and Services	Jörg Liebeherr	Endowed		ECE
NSERC Chair in Multidisciplinary Engineering Design	Kamran Behdinan	NSERC		MIE
NSERC Industrial Research Chair in Source Water Quality Monitoring and Advanced/Emerging Technologies for Drinking Water Treatment	Robert Andrews	NSERC		CivE
NSERC Industrial Research Chair in Technologies for Drinking Water Treatment	Ron Hofmann	NSERC		CivE
NSERC/Altera Industrial Research Chair in Programmable Silicon	Vaughn Betz	NSERC/Altera		ECE
NSERC/Cement Association of Canada Industrial Research Chair in Concrete Durability and Sustainability	Doug Hooton	NSERC/CAC		CivE
NSERC/P&WC Industrial Research Chair in Aviation Gas Turbine Combustion/Emissions Research and Design System Optimization	Sam Sampath	NSERC/P&WC		UTIAS
NSERC/UNENE Industrial Research Chair in Corrosion Control and Materials Performance in Nuclear Power Systems	Roger Newman	NSERC/UNENE		ChemE
Pierre Lassonde Chair in Mining Engineering	John Hadjigeorgiou	Endowed		CivE
Robert M. Smith Chair in Geotechnical Mine Design and Analysis	Murray Grabinsky	Endowed		CivE
Skoll Chair in Computer Networks and Enterprise Innovation	Elvino Sousa	Endowed		ECE
Skoll Chair in Software Engineering	Jason Anderson	Endowed		ECE
Stanley Ho Professorship in Microelectronics	Sorin Voinigescu	Endowed		ECE
The Stanley L. Meek Chair in Advanced Nanotechnology	Harry Ruda	Endowed		MSE
U of T Distinguished Professor in Application Platforms and Smart Infrastructure	Alberto Leon-Garcia			ECE
U of T Distinguished Professor in Global Engineering	Yu-Ling Cheng			ChemE
U of T Distinguished Professor in Plasma Engineering	Javad Mostaghimi			MIE
U of T Distinguished Professor of Digital Communications	Frank Kshischang			ECE
U of T Distinguished Professor of Microcellular Engineered Plastics	Chul Park			MIE
U of T Distinguished Professor of Urban Systems Engineering	Mark Fox			MIE
U of T Distinguished Professor of Mechanobiology	Craig Simmons			MIE, IBBME
U of T Distinguished Professor of Computational Aerodynamics and Sustainable Aviation	David Zingg			UTIAS
University Professor	Michael Collins			CivE
University Professor	Edward Sargent			ECE
University Professor	Michael Sefton			ChemE
University Professor	Molly Shoichet			ChemE, IBBME
Velma M. Rogers Graham Chair in Engineering	George Eleftheriades	Endowed		ECE
W. M. Keck Chair in Engineering Rock Mechanics	John Harrison	Endowed		CivE
Wallace G. Chalmers Chair of Engineering Design	Axel Guenther	Endowed		MIE

Appendix E: Research Funding by Academic Area

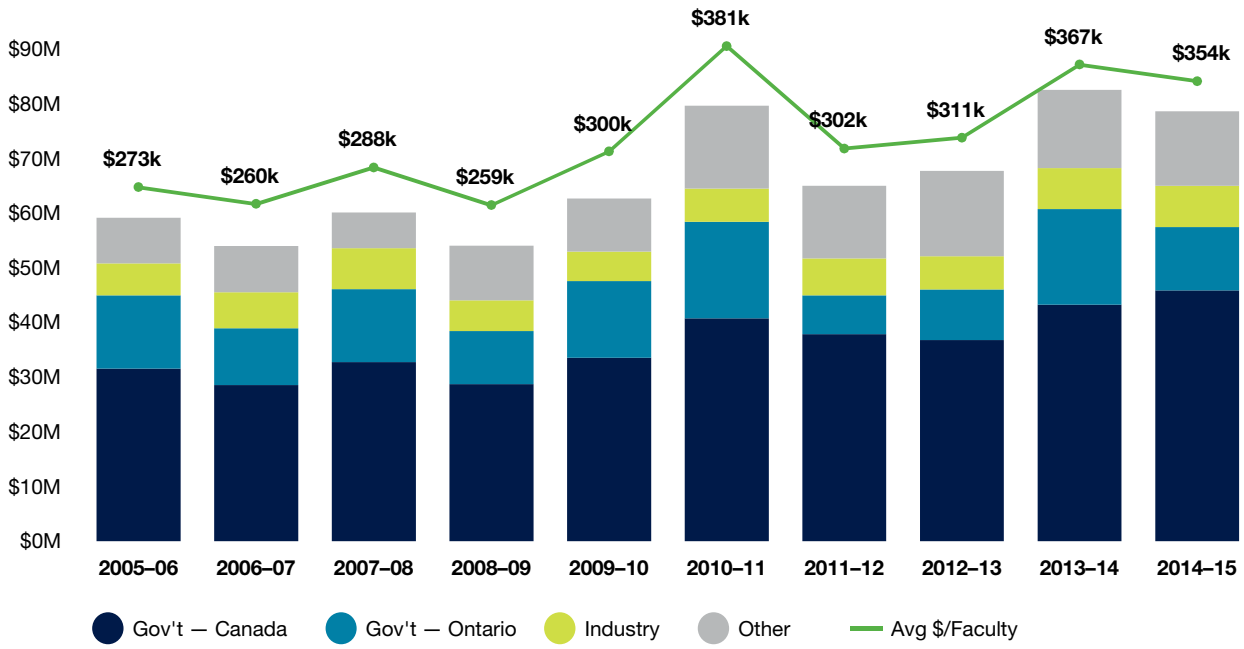
Figure E.1 shows our Faculty's total research funding, including operating and infrastructure.

Figures E.2 to E.8 in this appendix show research operating funding by department and institute over the last decade. This data excludes funding received under the following research infrastructure programs:

- Canada Foundation for Innovation (except the CFI Career Award)
- NSERC Research Tools & Instruments program for Faculty
- Ontario Innovation Trust
- Ontario Research Fund – Research Infrastructure

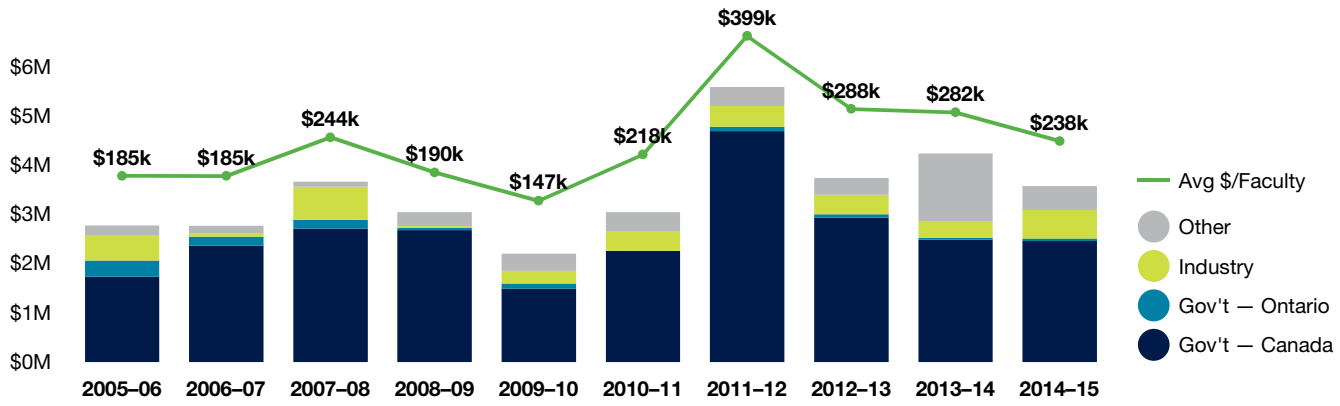
Data is based on grant years (April to March). For example, 2012–13 represents the granting cycle starting in April 2012 and ending in March 2013.

Figure E.1 University of Toronto Faculty of Applied Science & Engineering Total Research Funding by Source and Average Funding per Faculty Member, 2005–2006 to 2014–2015



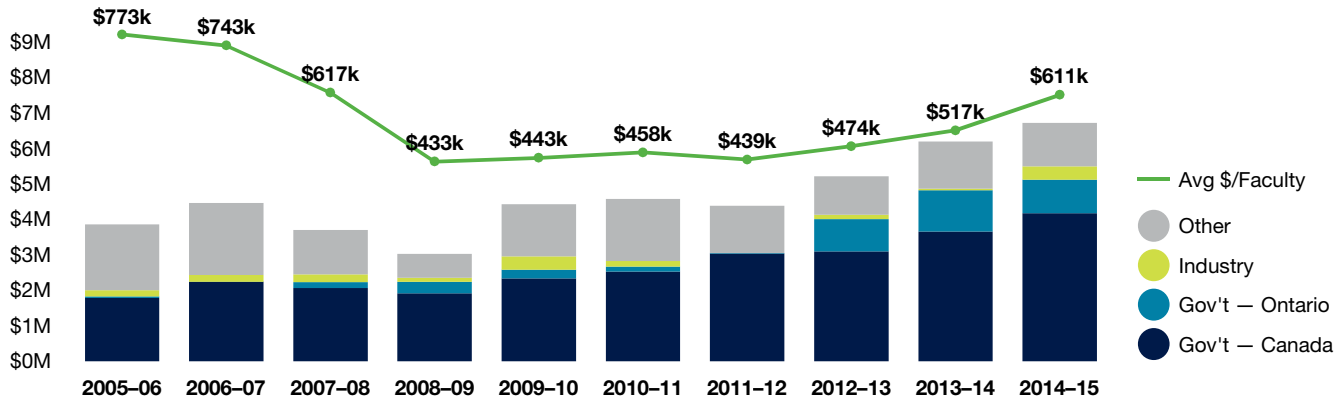
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2005–06	$31,573,788	$13,410,788	$5,848,143	$8,326,178	**$59,158,897**	**$272,622**
2006–07	$28,602,598	$10,360,149	$6,583,699	$8,479,398	**$54,025,844**	**$259,740**
2007–08	$32,801,606	$13,319,325	$7,520,781	$6,525,854	**$60,167,566**	**$287,883**
2008–09	$28,775,192	$9,661,808	$5,666,153	$9,996,059	**$54,099,212**	**$258,848**
2009–10	$33,558,391	$14,040,322	$5,415,268	$9,714,802	**$62,728,783**	**$300,138**
2010–11	$40,769,149	$17,676,249	$6,096,677	$15,152,585	**$79,694,660**	**$381,314**
2011–12	$37,892,435	$7,125,567	$6,705,219	$13,300,258	**$65,023,479**	**$302,435**
2012–13	$36,843,730	$9,221,859	$6,062,015	$15,631,214	**$67,758,818**	**$310,820**
2013–14	$43,270,328	$17,498,586	$7,476,802	$14,354,519	**$82,600,235**	**$367,112**
2014–15	$45,887,056	$11,616,389	$7,504,880	$13,650,347	**$78,658,672**	**$354,318**

Figure E.2 University of Toronto Institute for Aerospace Studies Research Operating Funding by Source and Average Funding per Faculty Member, 2005–2006 to 2014–2015



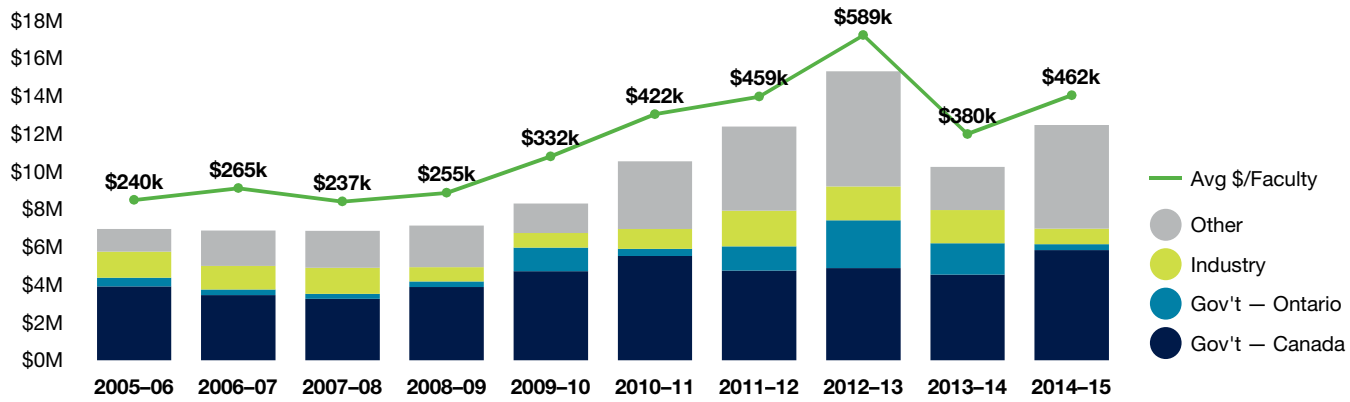
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2005–06	$1,737,031	$329,500	$499,365	$210,069	**$2,775,965**	**$185,064**
2006–07	$2,365,513	$185,000	$60,000	$161,533	**$2,772,046**	**$184,803**
2007–08	$2,712,542	$175,000	$679,227	$96,167	**$3,662,936**	**$244,196**
2008–09	$2,682,272	$45,000	$35,500	$282,968	**$3,045,740**	**$190,359**
2009–10	$1,486,735	$107,333	$259,200	$349,358	**$2,202,626**	**$146,842**
2010–11	$2,261,742		$390,200	$396,936	**$3,048,878**	**$217,777**
2011–12	$4,692,109	$89,356	$420,400	$386,989	**$5,588,854**	**$399,204**
2012–13	$2,931,459	$72,605	$397,116	$337,560	**$3,738,740**	**$287,595**
2013–14	$2,486,418	$35,708	$342,400	$1,372,126	**$4,236,652**	**$282,443**
2014–15	$2,458,871	$50,000	$584,609	$481,988	**$3,575,468**	**$238,365**

Figure E.3 Institute of Biomaterials & Biomedical Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2005–2006 to 2014–2015



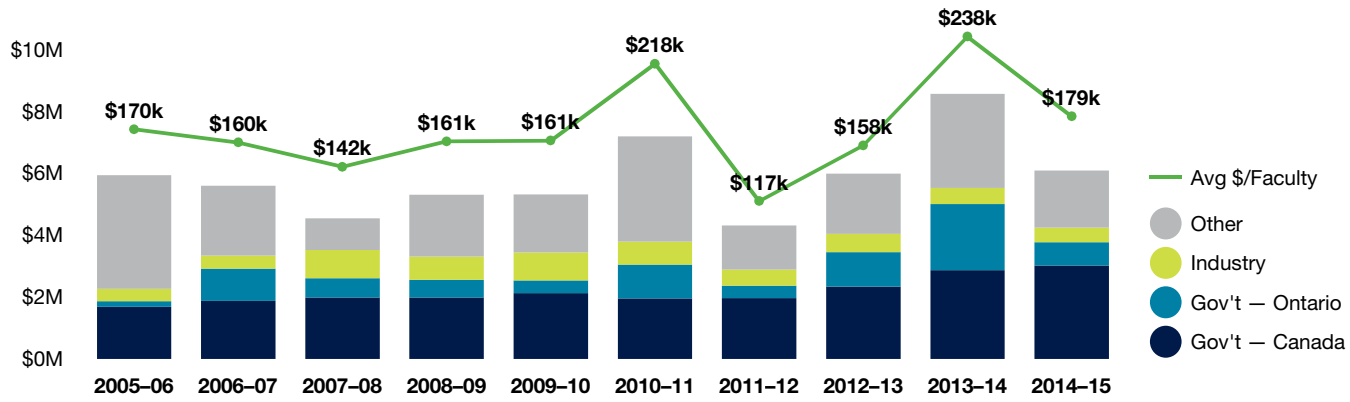
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2005–06	$1,782,028	$48,666	$176,220	$1,857,110	**$3,864,024**	**$772,805**
2006–07	$2,243,946	$1,333	$186,904	$2,027,941	**$4,460,124**	**$743,354**
2007–08	$2,065,500	$165,515	$222,300	$1,251,056	**$3,704,371**	**$617,395**
2008–09	$1,919,671	$317,147	$117,411	$678,498	**$3,032,727**	**$433,247**
2009–10	$2,337,302	$242,228	$375,037	$1,476,045	**$4,430,612**	**$443,061**
2010–11	$2,527,234	$142,383	$160,634	$1,748,787	**$4,579,038**	**$457,904**
2011–12	$3,040,869	$13,500		$1,330,768	**$4,385,137**	**$438,514**
2012–13	$3,098,604	$908,607	$121,090	$1,088,556	**$5,216,857**	**$474,260**
2013–14	$3,659,531	$1,158,809	$48,000	$1,331,805	**$6,198,145**	**$516,512**
2014–15	$4,177,002	$943,878	$371,689	$1,231,847	**$6,724,416**	**$611,311**

Figure E.4 Department of Chemical Engineering & Applied Chemistry Research Operating Funding by Source and Average Funding per Faculty Member, 2005–2006 to 2014–2015



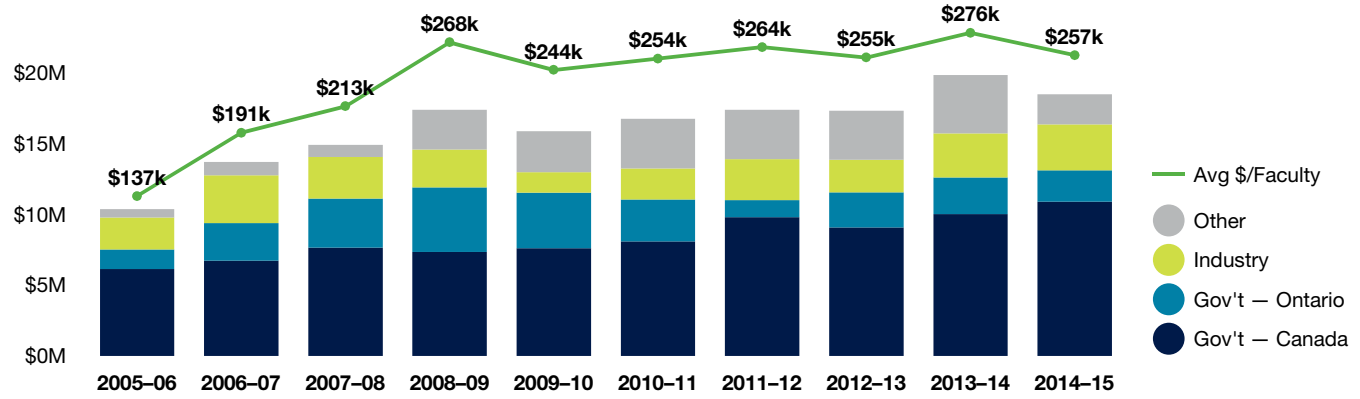
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2005–06	$3,914,479	$465,999	$1,379,766	$1,195,334	**$6,955,578**	**$239,848**
2006–07	$3,460,090	$290,203	$1,261,279	$1,875,921	**$6,887,493**	**$264,904**
2007–08	$3,267,829	$261,610	$1,368,550	$1,961,293	**$6,859,282**	**$236,527**
2008–09	$3,883,714	$299,378	$757,256	$2,202,402	**$7,142,750**	**$255,098**
2009–10	$4,717,078	$1,257,813	$781,842	$1,554,321	**$8,311,054**	**$332,442**
2010–11	$5,525,910	$388,844	$1,052,026	$3,581,019	**$10,547,799**	**$421,912**
2011–12	$4,759,256	$1,283,137	$1,897,761	$4,450,643	**$12,390,797**	**$458,918**
2012–13	$4,897,371	$2,528,978	$1,783,746	$6,111,048	**$15,321,143**	**$589,275**
2013–14	$4,551,511	$1,652,628	$1,761,315	$2,285,459	**$10,250,913**	**$379,663**
2014–15	$5,849,595	$309,298	$828,124	$5,485,081	**$12,472,098**	**$461,930**

Figure E.5 Department of Civil Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2005–2006 to 2014–2015



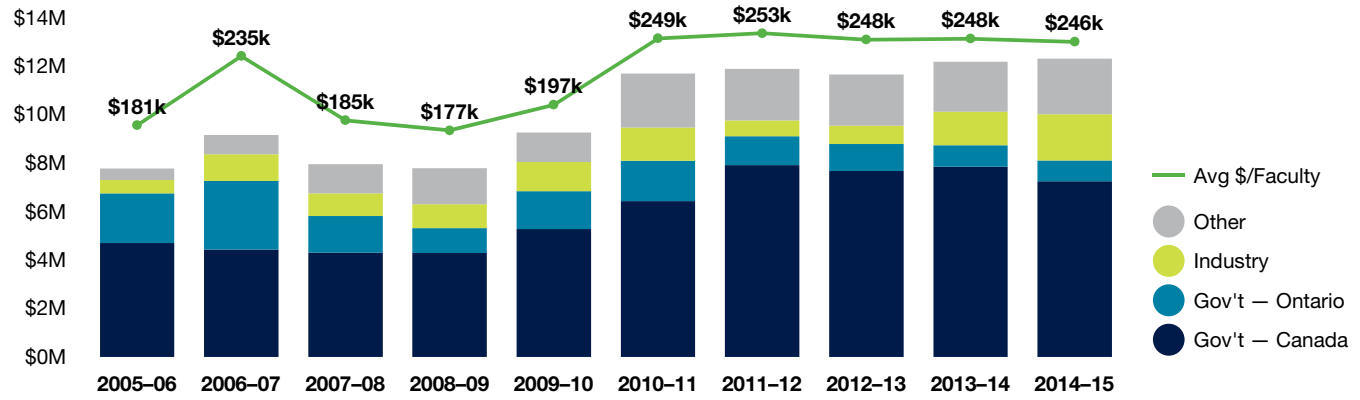
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2005–06	$1,685,873	$182,459	$404,084	$3,668,571	**$5,940,987**	**$169,742**
2006–07	$1,879,079	$1,040,229	$421,708	$2,261,010	**$5,602,026**	**$160,058**
2007–08	$1,990,013	$622,300	$910,734	$1,023,094	**$4,546,141**	**$142,067**
2008–09	$1,990,579	$572,670	$755,982	$1,988,916	**$5,308,147**	**$160,853**
2009–10	$2,129,407	$412,542	$906,466	$1,879,277	**$5,327,692**	**$161,445**
2010–11	$1,956,171	$1,097,073	$747,127	$3,399,792	**$7,200,163**	**$218,187**
2011–12	$1,971,794	$402,645	$515,359	$1,428,083	**$4,317,881**	**$116,699**
2012–13	$2,338,881	$1,121,004	$586,088	$1,952,886	**$5,998,859**	**$157,865**
2013–14	$2,872,286	$2,136,572	$528,078	$3,041,895	**$8,578,831**	**$238,301**
2014–15	$3,019,037	$762,246	$468,645	$1,847,498	**$6,097,426**	**$179,336**

Figure E.6 The Edward S. Rogers Sr. Department of Electrical & Computer Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2005–2006 to 2014–2015



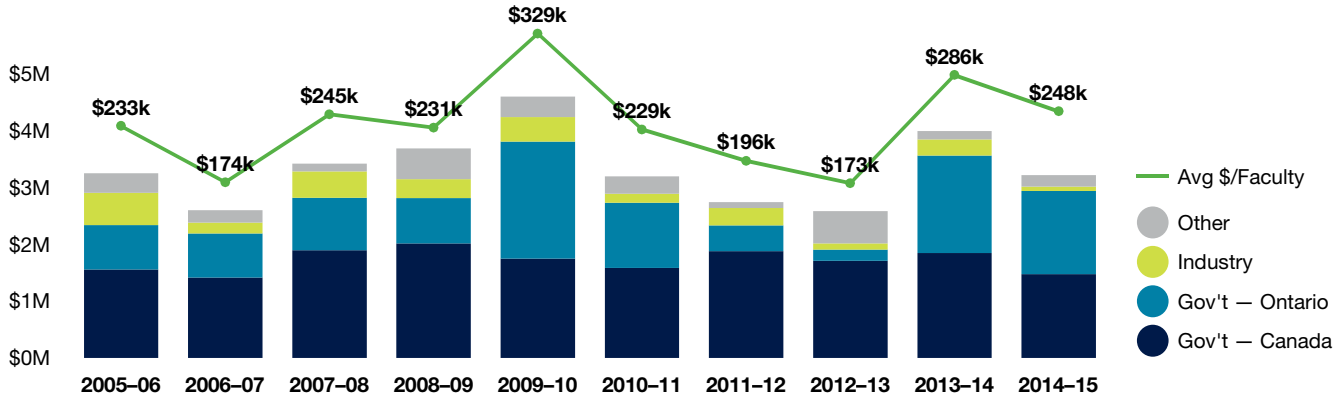
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2005–06	$6,154,141	$1,378,334	$2,266,096	$575,955	**$10,374,526**	**$136,507**
2006–07	$6,739,878	$2,660,526	$3,363,559	$957,306	**$13,721,269**	**$190,573**
2007–08	$7,654,810	$3,470,568	$2,950,516	$853,280	**$14,929,174**	**$213,274**
2008–09	$7,354,769	$4,551,690	$2,684,325	$2,815,615	**$17,406,399**	**$267,791**
2009–10	$7,620,706	$3,923,865	$1,456,958	$2,878,488	**$15,880,017**	**$244,308**
2010–11	$8,089,058	$2,962,550	$2,213,062	$3,491,863	**$16,756,533**	**$253,887**
2011–12	$9,804,328	$1,205,388	$2,910,981	$3,484,571	**$17,405,268**	**$263,716**
2012–13	$9,081,379	$2,481,833	$2,305,784	$3,465,717	**$17,334,713**	**$254,922**
2013–14	$10,032,197	$2,592,751	$3,117,251	$4,122,724	**$19,864,923**	**$275,902**
2014–15	$10,913,574	$2,204,063	$3,260,799	$2,115,017	**$18,493,453**	**$256,854**

Figure E.7 Department of Mechanical & Industrial Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2005–2006 to 2014–2015



	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2005–06	$4,703,394	$2,042,264	$555,242	$473,811	**$7,774,711**	**$180,807**
2006–07	$4,425,552	$2,833,485	$1,095,225	$804,332	**$9,158,594**	**$234,836**
2007–08	$4,297,733	$1,519,533	$924,880	$1,200,988	**$7,943,134**	**$184,724**
2008–09	$4,289,293	$1,027,566	$976,457	$1,486,804	**$7,780,120**	**$176,821**
2009–10	$5,276,172	$1,558,727	$1,203,710	$1,211,942	**$9,250,551**	**$196,820**
2010–11	$6,432,136	$1,653,762	$1,375,128	$2,224,992	**$11,686,018**	**$248,639**
2011–12	$7,912,011	$1,188,878	$657,854	$2,114,359	**$11,873,102**	**$252,619**
2012–13	$7,663,486	$1,115,661	$757,191	$2,105,840	**$11,642,178**	**$247,706**
2013–14	$7,844,628	$879,834	$1,393,542	$2,050,835	**$12,168,839**	**$248,344**
2014–15	$7,239,600	$860,477	$1,911,014	$2,288,560	**$12,299,651**	**$245,993**

Figure E.8 **Department of Materials Science & Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2005–2006 to 2014–2015**



	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg $/Faculty
2005–06	$1,561,749	$783,577	$567,370	$345,328	**$3,258,024**	**$232,716**
2006–07	$1,417,224	$777,970	$195,024	$216,848	**$2,607,066**	**$173,804**
2007–08	$1,898,382	$927,585	$464,574	$138,250	**$3,428,791**	**$244,914**
2008–09	$2,020,903	$796,601	$339,222	$539,173	**$3,695,899**	**$230,994**
2009–10	$1,754,687	$2,059,894	$432,055	$364,545	**$4,611,181**	**$329,370**
2010–11	$1,587,169	$1,150,973	$158,500	$309,101	**$3,205,743**	**$228,982**
2011–12	$1,886,112	$453,820	$302,864	$104,500	**$2,747,296**	**$196,235**
2012–13	$1,715,249	$196,359	$111,000	$569,275	**$2,591,883**	**$172,792**
2013–14	$1,850,798	$1,716,977	$286,216	$149,675	**$4,003,666**	**$285,976**
2014–15	$1,479,347	$1,464,291	$80,000	$200,356	**$3,223,994**	**$248,000**

Appendix F: Spinoff Companies

Est.	Company Name	Engineering Affiliation	Department
2015	Appulse Inc. (formerly ICE3 Power Technologies Inc.)	Aleksander Prodic	ECE
2015	Deep Genomics Inc.	Brendan Frey	ECE
2015	Enhanced Biomodulation Technologies Inc.	Paul Yoo	IBBME
2015	ExCellThera Inc.	Peter Zandstra	IBBME
2015	Onyx Motion Inc.	Marissa Wu	IBBME
2015	Tara Biosystems, Inc.	Milica Radisic	IBBME, ChemE
2014	Arrowonics Inc.	Hugh Liu	UTIAS
2014	Enceladeus Imaging	Steve Mann	ECE
2014	IQBiomedical	David Sinton	MIE
2014	Pragmatek Transport Innovations, Inc.	Baher Abdulhai	CivE
2014	QD Solar Inc.	Sjoerd Hoogland and Ted Sargent	ECE
2014	Sonas Systems Inc.	Joyce Poon	ECE
2014	SpineSonics Medical Inc.	Richard Cobbold	IBBME
2014	Toronto Nano Instrumentation Inc. (TNi Inc.)	Yu Sun	MIE
2014	XCellPure Inc.	Milica Radisic	IBBME, ChemE
2014	XTouch Inc.	Parham Aarabi	ECE
2013	CoursePeer	Hadi Aladdin	ECE
2013	eQOL Inc.	Binh Nguyen	ECE
2013	Kydo Engineering	John Ruggieri	ChemE
2013	Whirlscape Inc.	Will Walmsley	MIE
2012	Kinetica Dynamics Inc.	Constantin Christopoulos	CivE
2012	MyTrak Health Systems	Sean Doherty	CivE
2012	OTI Lumionics Inc.	Zheng-Hong Lu	MSE
2012	XTT	Parham Aarabi	ECE
2011	Aereus Technologies Inc. (formerly Aereus Wood)	Javad Mostaghimi	MIE
2011	Bionym Inc.	Karl Martin	ECE
2011	Filaser Inc.	Peter Herman	ECE
2011	Luminautics Inc. (formerly Ensi Solutions)	Graham Murdoch	MSE
2011	Nymi (Formerly Bionym Inc.)	Karl Martin	ECE
2011	Ojiton Inc.	Tom Chau	IBBME
2011	PRISED Solar Inc.	Wahid Shams-Kolahi	ECE
2011	RenWave	Mohamed Kamh	ECE
2011	Sense Intelligent	Brian Hu	ECE
2011	Xagenic Canada Inc.	Ted Sargent	ECE
2010	Arda Power Inc.	Peter Lehn	ECE
2010	FOTA Technologies	Tony Chan Carusone	ECE
2009	Chip Care Corp.	J. Stewart Aitchison	ECE
2009	Cytodiagnostics	Warren Chan	IBBME
2009	Peraso Technologies Inc.	Sorin Voinigescu	ECE
2008	Ablazeon Inc.	Javad Mostaghimi	MIE
2008	Arch Power Inc.	Mohammad (Reza) Iravani	ECE
2008	AXAL Inc.	Milos Popovic and Egor Sanin	IBBME
2008	Incise Photonics Inc.	Peter Herman	ECE
2008	Quantum Dental Technologies	Andreas Mandelis	MIE
2008	Simple Systems Inc.	Milos Popovic, Aleksandar Prodic and Armen Baronijan	ECE, IBBME
2007	002122461 Ontario Inc.	Harry Ruda	MSE
2007	Cast Connex Corp.	Jeffrey Packer and Constantin Christopoulos	CivE
2007	Elastin Specialties	Kimberly Woodhouse	ChemE
2007	Inometrix Inc.	Michael Galle	ECE
2007	Modiface Inc.	Parham Aarabi	ECE
2007	Neurochip Inc.	Berj Bardakjian	IBBME
2007	Viewgenie Inc.	Parham Aarabi	ECE
2006	Anviv Mechatronics Inc. (AMI)	Andrew Goldenberg	MIE
2006	InVisage Technologies Inc.	Ted Sargent	ECE
2006	Metabacus	Jianwen Zhu	ECE

2006	Vennsa Technologies Inc.	Andreas Veneris and Sean Safarpour	ECE
2005	Greencore Composites	Mohini Sain	Forestry, ChemE
2004	Field Metrica Inc. (FMI)	Tim DeMonte, Richard Yoon	IBBME
2004	Tissue Regeneration Therapeutics Inc. (TRT)	J.E. Davies	IBBME
2003	1484667 Ontario Inc.	Brad Saville	ChemE
2003	ArchES Computing Systems Corp.	Paul Chow	ECE
2003	Norel Optronics Inc.	Zheng-Hong Lu	MSE
2003	Vocalage Inc.	Mark Chignell	MIE
2002	Information Intelligence Corporation (IIC)	Burhan Turksen	MIE
2002	MatRegen Corp.	Molly Shoichet	IBBME, ChemE
2002	OMDEC Inc.	Andrew K.S. Jardine	MIE
2002	SiREM	Elizabeth Edwards	ChemE
2001	Fox-Tek	Rod Tennyson	UTIAS
2001	Insception Biosciences	Peter Zandstra	IBBME
2001	Interface Biologics	Paul Santerre	IBBME
2000	Biox Corporation	David Boocock	ChemE
2000	Photo-Thermal Diagnostics Inc.	Andreas Mandelis	MIE
2000	Simulent Inc.	Javad Mostaghimi	MIE
2000	Virtek Engineering Science Inc.	Andrew Goldenberg	MIE
1999	Accelight Networks Inc.	Alberto Leon-Garcia and Paul Chow	ECE
1999	em2 Inc.	J.E. Davies	IBBME
1999	Soma Networks	Michael Stumm and Martin Snelgrove	ECE
1999	Vivosonic Inc.	Yuri Sokolov and Hans Kunov	IBBME
1998	1208211 Ontario Ltd. (affiliate: Regen StaRR)	Robert Pilliar, Rita Kandel and Marc Grynpas	IBBME
1998	BANAK Inc.	Andrew K.S. Jardine	MIE
1998	BoneTec Corp. (now owned by subsidiary of TRT)	J.E. Davies and Molly Shoichet	IBBME
1998	Right Track CAD Corp.	Jonathan Rose	ECE
1998	SMT HyrdaSil	Rod Tennyson	UTIAS
1998	Snowbush Microelectronics	Kenneth Martin and David Johns	ECE
1997	Rimon Therapeutics	Michael Sefton	IBBME, ChemE
1996	OANDA Corp.	Michael Stumm	ECE
1996	Rocscience Inc.	John Curran	CivE
1995	Amilog Systems		MIE
1995	Electrobiologies	Paul Madsen	IBBME
1995	Hydrogenics Corp.		MIE
1995	Tribokinetics Inc.	Raymond Woodhams	ChemE
1994	Key Lime Co.	Honghi Tran	ChemE
1994	Trantek Power		ECE
1993	Electro Photonics	Raymond Measures	UTIAS
1993	Liquid Metal Sonics Ltd.		MSE
1993	SAFE Nozzle Group	Honghi Tran	ChemE
1993	SmartSpeaker Corp.	Anees Munshi	ECE
1992	Condata Technologies Ltd.		ECE
1992	Gao Research & Consulting Ltd.	Frank Gao	ECE
1992	Novator Systems Ltd.	Mark Fox	MIE
1992	Paul Madsen Medical Devices	Hans Kunov	IBBME
1992	PolyPhalt Inc.	Raymond Woodhams	ChemE
1991	Advent Process Engineering Inc.		MSE
1991	LinShin Canada Inc.		IBBME
1991	Minnovex	Glenn Dobby	MSE
1991	Redrock Solvers Inc.	Michael Carter	MIE
1990	Fibre Metrics	Dale Hogg	UTIAS
1989	Apollo Environmental Systems Corp.	John Harbinson	ChemE
1989	Integrity Testing Laboratory Inc. (ITL)		UTIAS
1989	Translucent Technologies	Paul Milgram	MIE
1989	Xiris Automation Inc.	Cameron Serles	MIE
1988	Advanced Materials Technologies	Steven Thorpe	MSE
1988	Food BioTek Corp.	Leon Rubin	ChemE
1988	HydraTek and Associates Inc.	Bryan Karney and (since 2006) Fabian Papa	CivE

Appendix G: Descriptions of Major Awards

Chapter 5: Awards and Honours summarizes the international, national and provincial awards our faculty and alumni received. Below are descriptions of some of those awards and honours.

International

American Association for the Advancement of Science (AAAAS) Fellowship — Engineering Section
Recognition of extraordinary achievements across disciplines by a member whose efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished. The AAAS is the world's largest general scientific society.

MIT Top 35 Under 35
Awarded to world's top 35 young innovators under the age of 35 by *MIT Technology Review* magazine.

U.S. National Academies
The National Academies serve (collectively) as the scientific national academy for the United States.

National

3M Teaching Fellowship
Canada's highest teaching award in recognition of educational excellence and leadership.

Alan Blizzard Award
Recognition for exemplary collaboration in university teaching as it enhances student learning.

Canadian Academy of Engineering (CAE) Fellowship
Recognition for distinguished achievements and career-long service to the engineering profession.

Engineering Institute of Canada (EIC) Fellowship
Recognition for exceptional contributions to engineering in Canada and for service to the profession and to society.

Engineering Institute of Canada (EIC) Awards
Recognition of outstanding engineers for exemplary contributions to engineering achievement in Canada and the world.

Engineers Canada Awards
Recognition of outstanding Canadian engineers, teams of engineers, engineering projects and engineering students.

Killam Prize
Awarded to distinguished Canadian scholars conducting research in one of five fields of study, including engineering, by the Canada Council for the Arts.

Killam Research Fellowship
Awarded to an established scholar who has demonstrated outstanding research ability and has published research results in substantial publications in their field by the Canada Council for the Arts.

Manning Innovation Award
Recognition of Canadian innovators who are improving the lives of Canadians and others around the world through their commercialized innovations.

Royal Society of Canada (RSC) Fellowship
Highest Canadian honour a scholar can achieve in the arts, humanities and sciences.

Royal Society of Canada (RSC) College of New Scholars, Artists and Scientists
Members are Canadian scholars who, at an early stage in their career, have demonstrated a high level of achievement and excellence.

Steacie Fellowship
Awarded to enhance the career development of outstanding and highly promising scientists and engineers by the Natural Sciences and Engineering Research Council (NSERC).

Steacie Prize
Awarded to a scientist or engineer 40 years of age of less for outstanding scientific research carried out in Canada.

Synergy Award for Innovation
Recognition for university-industry collaboration that stands as a model of effective partnership.

Provincial

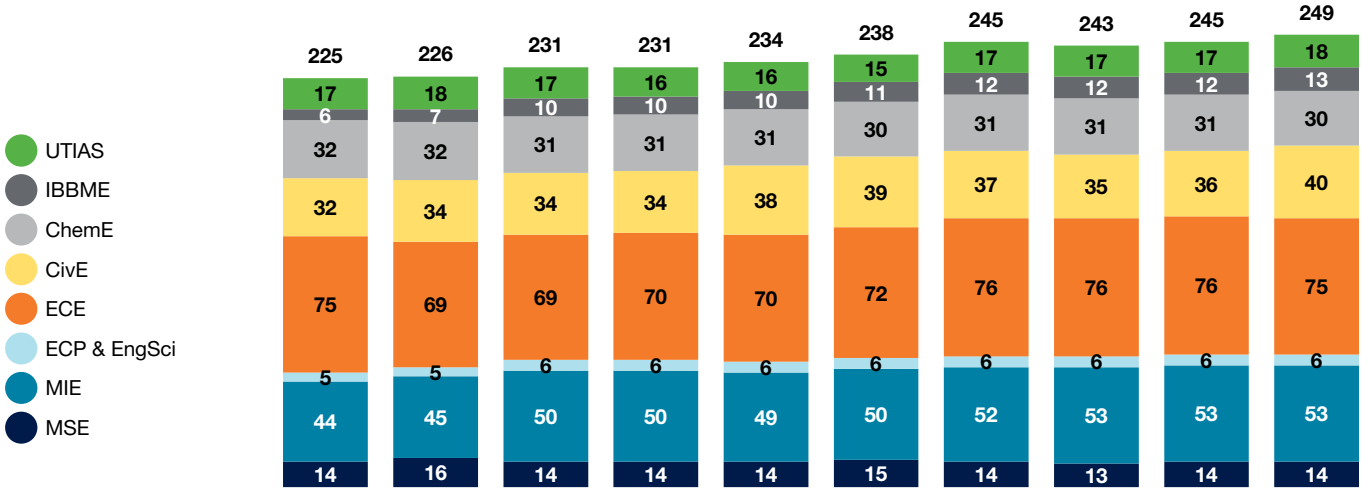
Ontario Professional Engineers Awards
Awarded to Professional Engineers Ontario members who have contributed substantially to the advancement of the engineering profession in any of its branches.

Ontario Confederation of University Faculty Associations (OCUFA) Teaching Award
Recognition of individuals with exceptional contributions to the higher education community in Ontario, including teaching philosophy, curriculum development and research on university teaching.

Appendix H: Academic Staff by Academic Area

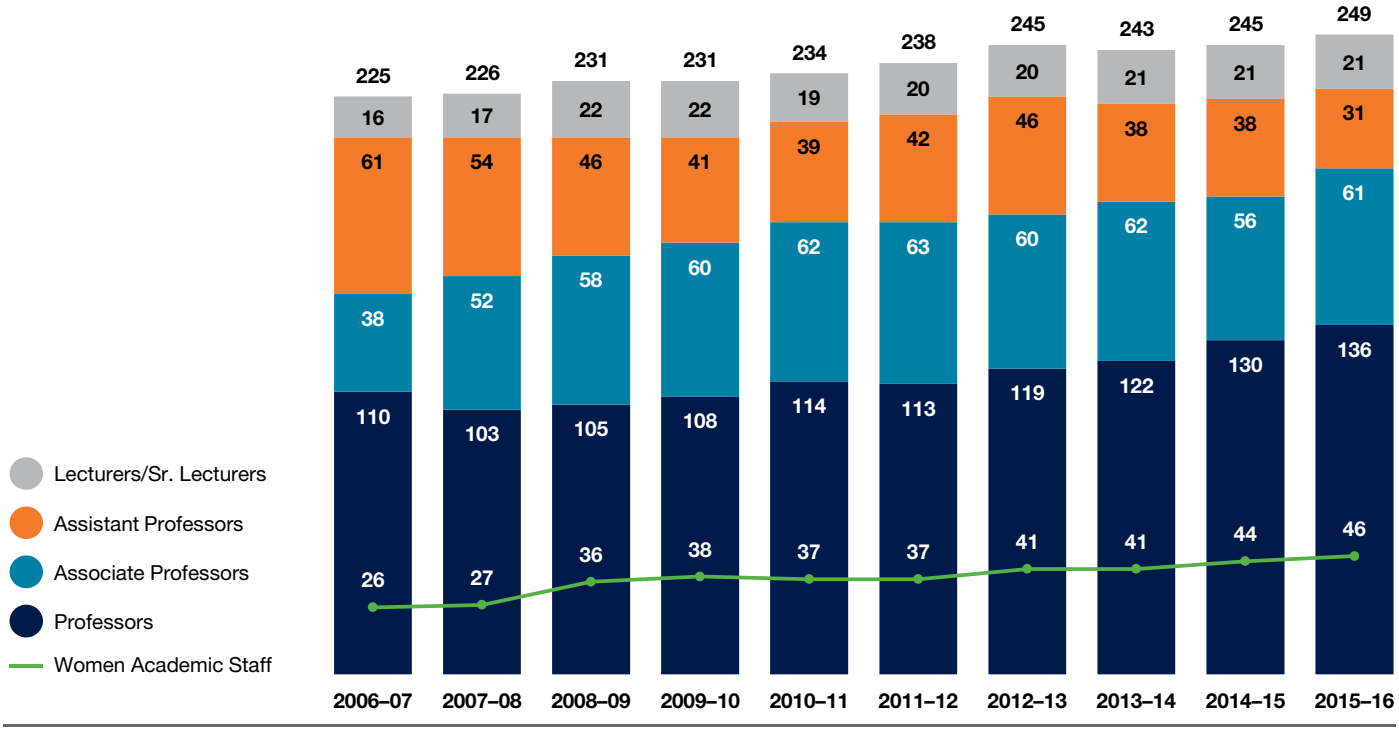
The figures in Appendix H show the composition of our academic staff from 2006–2007 to 2015–2016. Figures H.1a and H.1b provide a Faculty overview and H.2 to H.8 present a detailed analysis by academic area.

Figure H.1a **Total Academic Staff by Academic Area, 2006–2007 to 2015–2016**



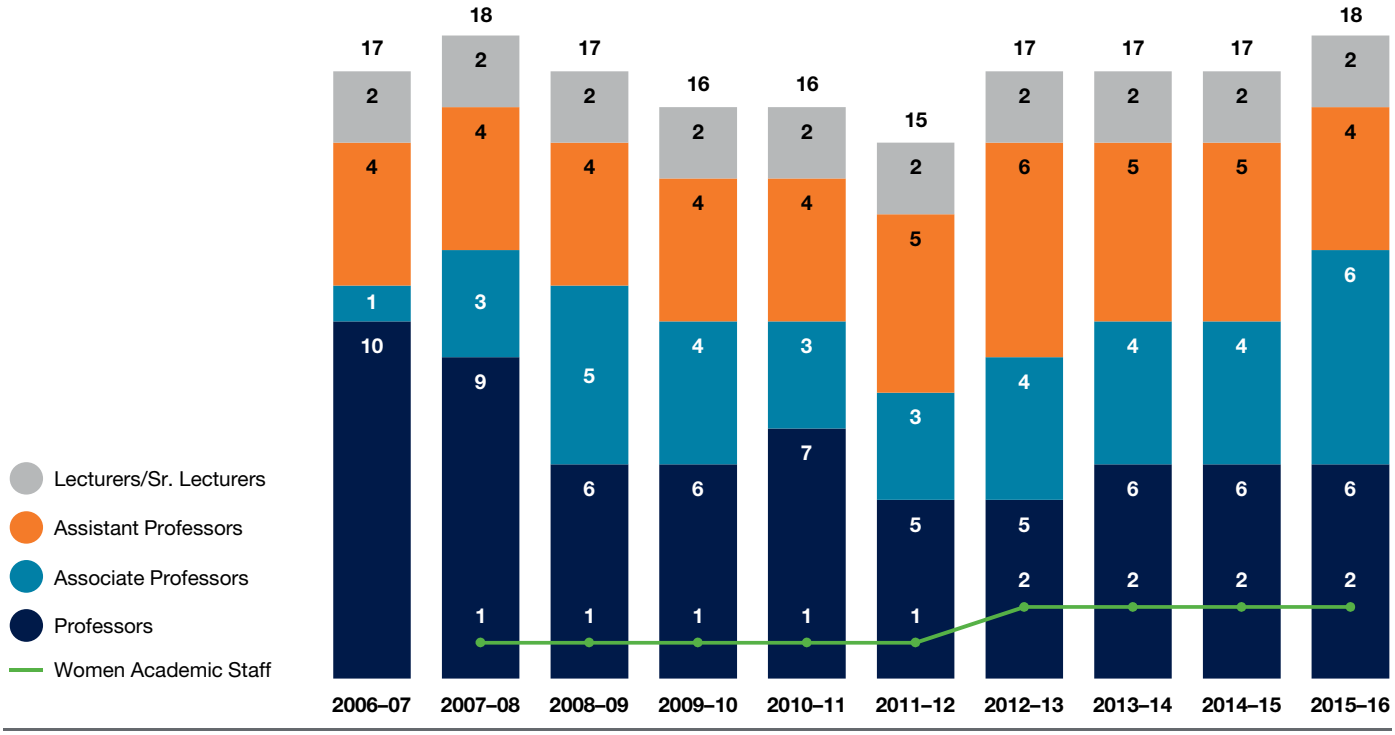
		2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
UTIAS	Assistant Profs	4	4	4	4	4	5	6	5	5	4
	Associate Profs	1	3	5	4	3	3	4	4	4	6
	Professors	10	9	6	6	7	5	5	6	6	6
	Lecturers	2	2	2	2	2	2	2	2	2	2
IBBME	Assistant Profs	3	3	6	5	3	5	6	5	4	4
	Associate Profs	3	3	3	1	3	3	2	2	3	4
	Professors	0	1	1	4	4	3	4	4	4	4
	Lecturers	0	0	0	0	0	0	0	1	1	1
ChemE	Assistant Profs	4	5	5	6	7	5	6	4	5	4
	Associate Profs	3	3	3	2	2	3	3	5	5	5
	Professors	22	20	17	17	18	18	18	18	17	17
	Lecturers	3	4	6	6	4	4	4	4	4	4
CivE	Assistant Profs	11	8	6	6	9	9	8	7	8	5
	Associate Profs	6	10	12	12	11	10	11	11	9	14
	Professors	15	15	15	15	17	19	17	16	18	20
	Lecturers	0	1	1	1	1	1	1	1	1	1
ECE	Assistant Profs	25	18	9	8	7	9	11	9	7	5
	Associate Profs	15	22	26	26	25	25	22	20	16	16
	Professors	30	25	30	32	34	34	39	43	49	50
	Lecturers	5	4	4	4	4	4	4	4	4	4
ECP & EngSci	Lecturers	5	5	6	6	6	6	6	6	6	6
MIE	Assistant Profs	13	14	13	11	8	7	7	6	6	6
	Associate Profs	6	7	8	12	15	16	14	16	15	12
	Professors	24	23	26	24	24	24	28	28	29	32
	Lecturers	1	1	3	3	2	3	3	3	3	3
MSE	Assistant Profs	1	2	2	1	1	2	2	2	3	3
	Associate Profs	4	4	2	3	3	3	4	4	4	4
	Professors	9	10	10	10	10	10	8	7	7	7
	Lecturers	0	0	0	0	0	0	0	0	0	0
Total		**225**	**226**	**231**	**231**	**234**	**238**	**245**	**243**	**245**	**249**

Figure H.1b **University of Toronto Faculty of Applied Science & Engineering Total Academic Staff by Position with Percentage of Women, 2006–2007 to 2015–2016**



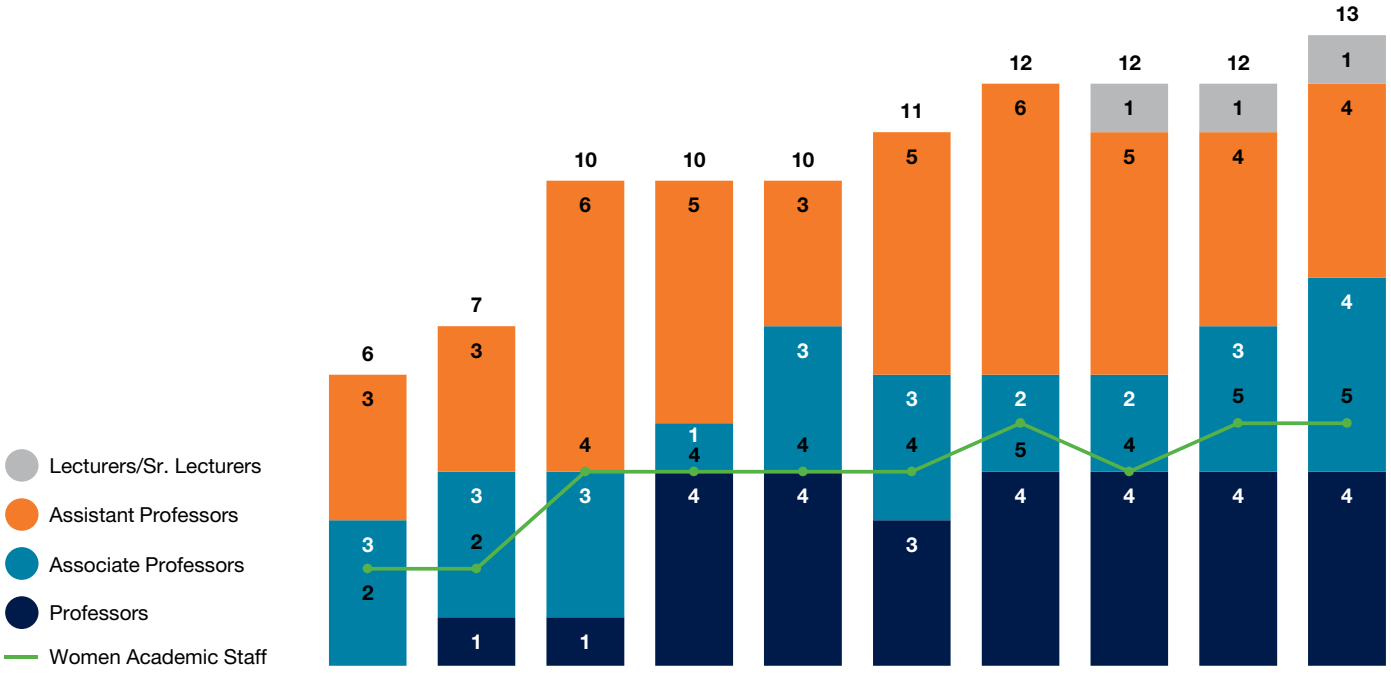
	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Assistant Professors	61	54	46	41	39	42	46	38	38	31
Women Assistant Professors	13	12	17	17	15	14	16	10	12	8
% Women Assistant Professors	**21.3%**	**22.2%**	**37.0%**	**41.5%**	**38.5%**	**33.3%**	**34.8%**	**26.3%**	**31.6%**	**25.8%**
Associate Professors	38	52	58	60	62	63	60	62	56	61
Women Associate Professors	5	6	8	10	13	13	13	17	14	17
% Women Associate Professors	**13.2%**	**11.5%**	**13.8%**	**16.7%**	**21.0%**	**20.6%**	**21.7%**	**27.4%**	**25.0%**	**27.9%**
Professors	110	103	105	108	114	113	119	122	130	136
Women Professors	5	6	5	5	5	6	8	9	13	16
% Women Professors	**4.5%**	**5.8%**	**4.8%**	**4.6%**	**4.4%**	**5.3%**	**6.7%**	**7.4%**	**10.0%**	**11.8%**
Lecturers/ Sr. Lecturers	16	17	22	22	19	20	20	21	21	21
Women Lecturers/ Sr. Lecturers	3	3	6	6	4	4	4	5	5	5
% Women Lecturers/ Sr. Lecturers	**18.8%**	**17.6%**	**27.3%**	**27.3%**	**21.1%**	**20.0%**	**20.0%**	**23.8%**	**23.8%**	**23.8%**
Total Tenured and Tenure Stream	209	209	209	209	215	218	225	222	224	228
Women Tenured and Tenure Stream	23	24	30	32	33	33	37	36	39	41
% Women Tenured and Tenure Stream	**11.0%**	**11.5%**	**14.4%**	**15.3%**	**15.3%**	**15.1%**	**16.4%**	**16.2%**	**17.4%**	**18.0%**
Total Academic Staff	225	226	231	231	234	238	245	243	245	249
Women Academic Staff	26	27	36	38	37	37	41	41	44	46
% Women Academic Staff	**11.6%**	**11.9%**	**15.6%**	**16.5%**	**15.8%**	**15.5%**	**16.7%**	**16.9%**	**18.0%**	**18.5%**

Figure H.2 **University of Toronto Institute for Aerospace Studies: Academic Staff by Position with Percentage of Women, 2006–2007 to 2015–2016**



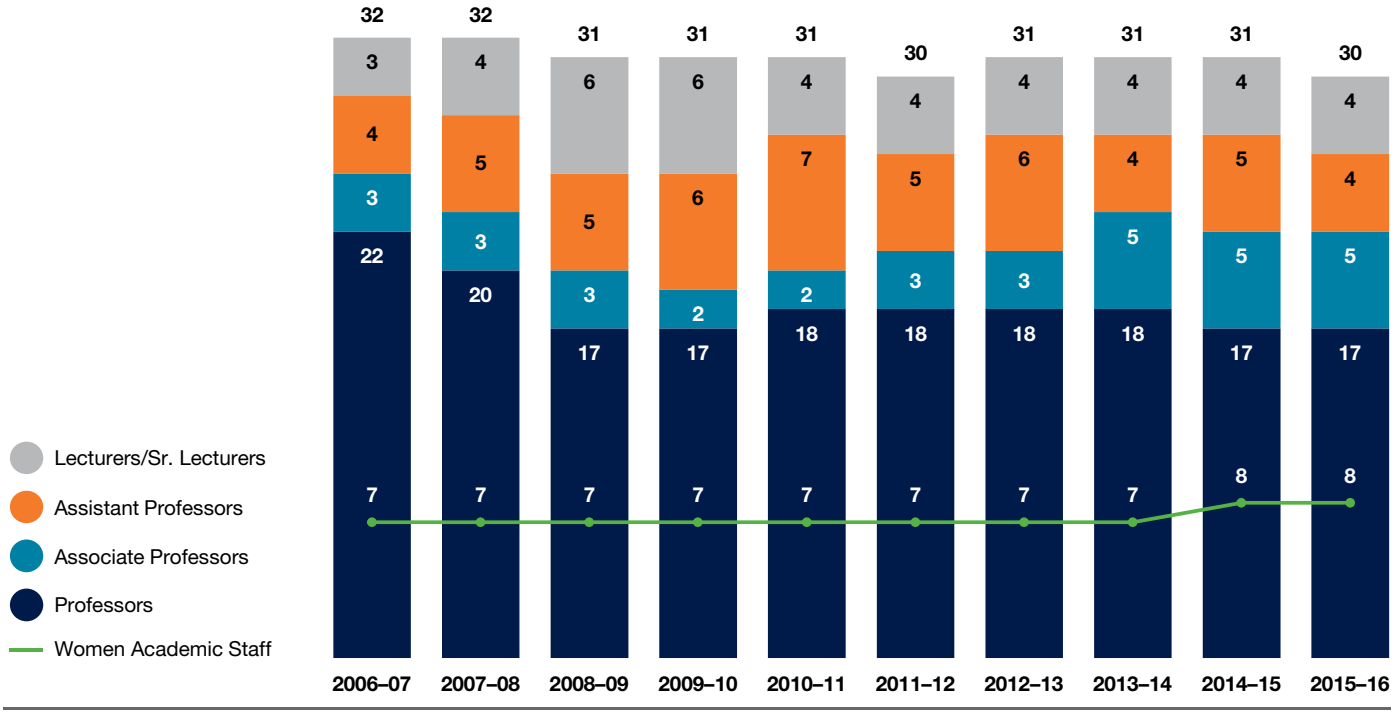
	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Assistant Professors	4	4	4	4	4	5	6	5	5	4
Women Assistant Professors	0	1	1	1	1	1	2	2	2	1
% Women Assistant Professors	**0.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**	**20.0%**	**33.3%**	**40.0%**	**40.0%**	**25.0%**
Associate Professors	1	3	5	4	3	3	4	4	4	6
Women Associate Professors	0	0	0	0	0	0	0	0	0	1
% Women Associate Professors	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**16.7%**
Professors	10	9	6	6	7	5	5	6	6	6
Women Professors	0	0	0	0	0	0	0	0	0	0
% Women Professors	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Lecturers/ Sr. Lecturers	2	2	2	2	2	2	2	2	2	2
Women Lecturers/ Sr. Lecturers	0	0	0	0	0	0	0	0	0	0
% Women Lecturers/ Sr. Lecturers	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total Tenured and Tenure Stream	15	16	15	14	14	13	15	15	15	16
Women Tenured and Tenure Stream	0	1	1	1	1	1	2	2	2	2
% Women Tenured and Tenure Stream	**0.0%**	**6.3%**	**6.7%**	**7.1%**	**7.1%**	**7.7%**	**13.3%**	**13.3%**	**13.3%**	**12.5%**
Total Academic Staff	17	18	17	16	16	15	17	17	17	18
Women Academic Staff	0	1	1	1	1	1	2	2	2	2
% Women Academic Staff	**0.0%**	**5.6%**	**5.9%**	**6.3%**	**6.3%**	**6.7%**	**11.8%**	**11.8%**	**11.8%**	**11.1%**

Figure H.3 **Institute of Biomaterials & Biomedical Engineering: Academic Staff by Position with Percentage of Women, 2006–2007 to 2015–2016**



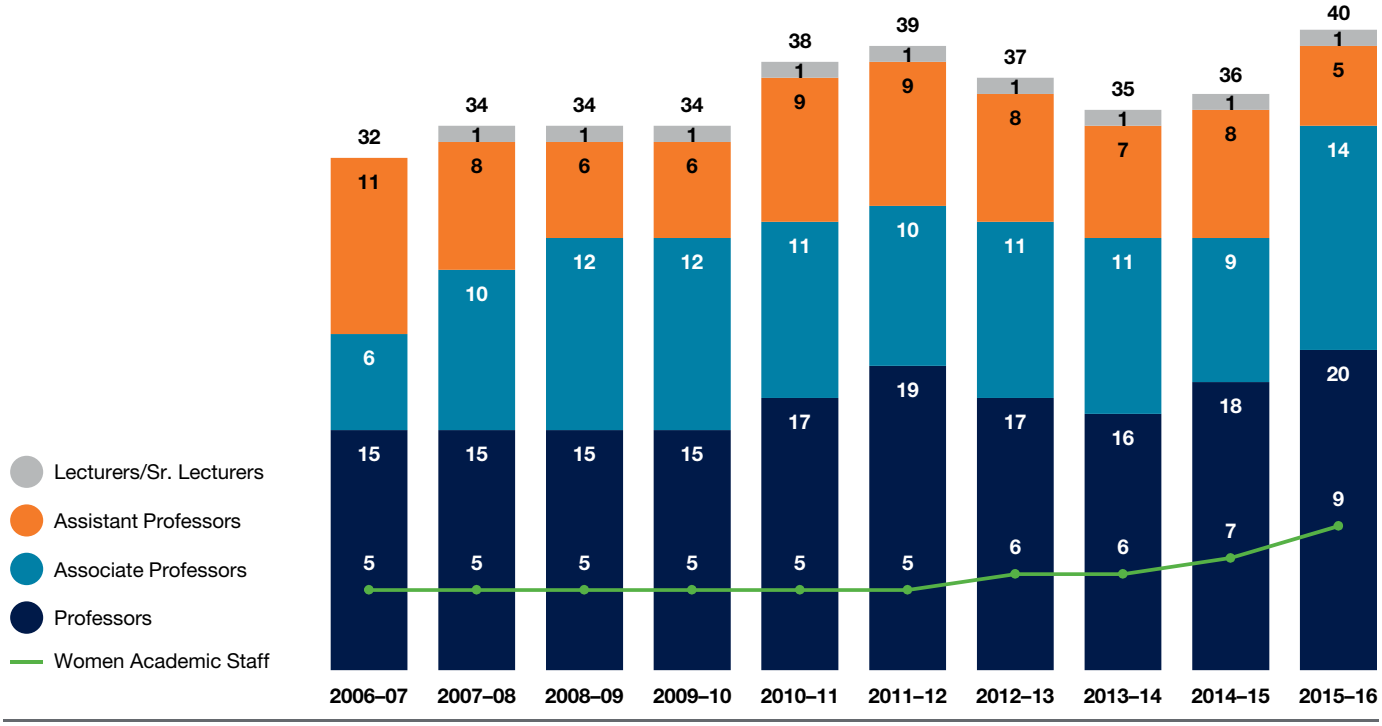
	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Assistant Professors	3	3	6	5	3	5	6	5	4	4
Women Assistant Professors	2	2	4	4	2	2	3	1	2	2
% Women Assistant Professors	**66.7%**	**66.7%**	**66.7%**	**80.0%**	**66.7%**	**40.0%**	**50.0%**	**20.0%**	**50.0%**	**50.0%**
Associate Professors	3	3	3	1	3	3	2	2	3	4
Women Associate Professors	0	0	0	0	2	2	2	2	1	1
% Women Associate Professors	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**66.7%**	**66.7%**	**100.0%**	**100.0%**	**33.3%**	**25.0%**
Professors	0	1	1	4	4	3	4	4	4	4
Women Professors	0	0	0	0	0	0	0	0	1	1
% Women Professors	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**25.0%**	**25.0%**
Lecturers/ Sr. Lecturers	0	0	0	0	0	0	0	1	1	1
Women Lecturers/ Sr. Lecturers	0	0	0	0	0	0	0	1	1	1
% Women Lecturers/ Sr. Lecturers	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**
Total Tenured and Tenure Stream	6	7	10	10	10	11	12	11	11	12
Women Tenured and Tenure Stream	2	2	4	4	4	4	5	3	4	4
% Women Tenured and Tenure Stream	**33.3%**	**28.6%**	**40.0%**	**40.0%**	**40.0%**	**36.4%**	**41.7%**	**27.3%**	**36.4%**	**33.3%**
Total Academic Staff	6	7	10	10	10	11	12	12	12	13
Women Academic Staff	2	2	4	4	4	4	5	4	5	5
% Women Academic Staff	**33.3%**	**28.6%**	**40.0%**	**40.0%**	**40.0%**	**36.4%**	**41.7%**	**33.3%**	**41.7%**	**38.5%**

Figure H.4 **Department of Chemical Engineering & Applied Chemistry: Academic Staff by Position with Percentage of Women, 2006–2007 to 2015–2016**



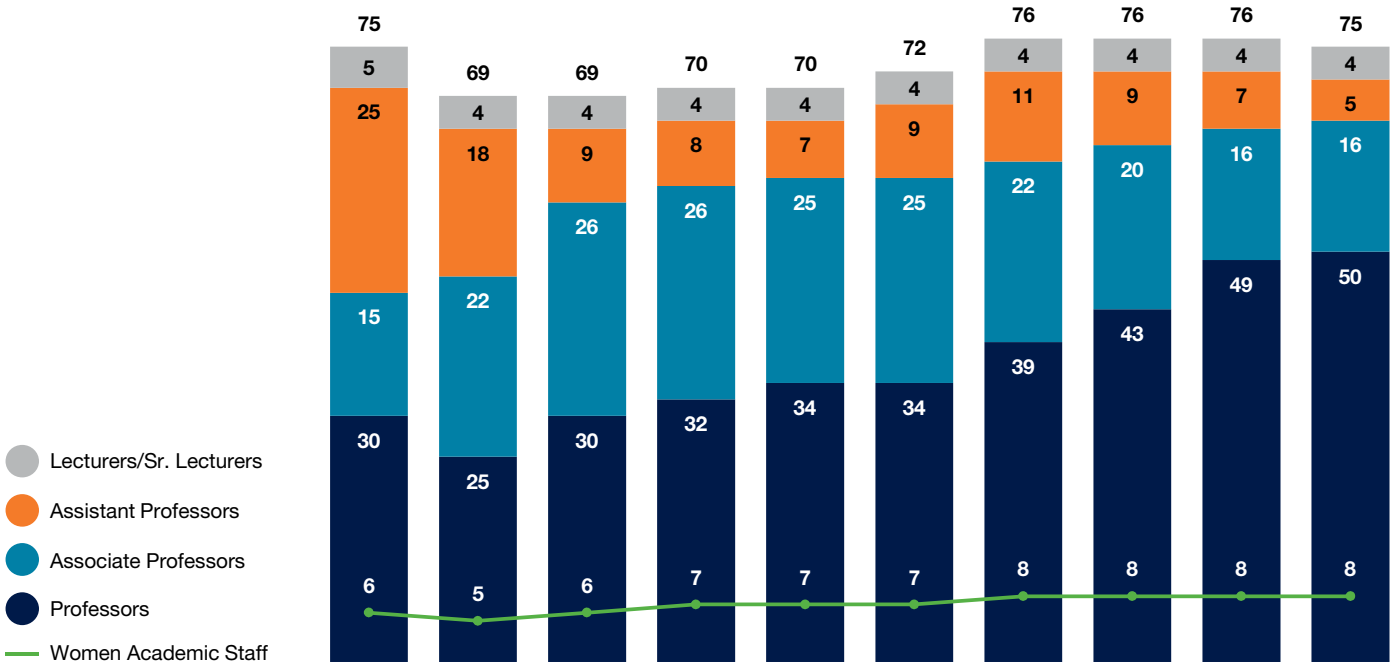
	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Assistant Professors	4	5	5	6	7	5	6	4	5	4
Women Assistant Professors	2	2	2	2	3	2	2	2	3	2
% Women Assistant Professors	**50.0%**	**40.0%**	**40.0%**	**33.3%**	**42.9%**	**40.0%**	**33.3%**	**50.0%**	**60.0%**	**50.0%**
Associate Professors	3	3	3	2	2	3	3	5	5	5
Women Associate Professors	1	0	0	0	0	1	1	1	1	2
% Women Associate Professors	**33.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**33.3%**	**33.3%**	**20.0%**	**20.0%**	**40.0%**
Professors	22	20	17	17	18	18	18	18	17	17
Women Professors	3	4	3	3	3	3	3	3	3	3
% Women Professors	**13.6%**	**20.0%**	**17.6%**	**17.6%**	**16.7%**	**16.7%**	**16.7%**	**16.7%**	**17.6%**	**17.6%**
Lecturers/ Sr. Lecturers	3	4	6	6	4	4	4	4	4	4
Women Lecturers/ Sr. Lecturers	1	1	2	2	1	1	1	1	1	1
% Women Lecturers/ Sr. Lecturers	**33.3%**	**25.0%**	**33.3%**	**33.3%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**
Total Tenured and Tenure Stream	29	28	25	25	27	26	27	27	27	26
Women Tenured and Tenure Stream	6	6	5	5	6	6	6	6	7	7
% Women Tenured and Tenure Stream	**20.7%**	**21.4%**	**20.0%**	**20.0%**	**22.2%**	**23.1%**	**22.2%**	**22.2%**	**25.9%**	**26.9%**
Total Academic Staff	32	32	31	31	31	30	31	31	31	30
Women Academic Staff	7	7	7	7	7	7	7	7	8	8
% Women Academic Staff	**21.9%**	**21.9%**	**22.6%**	**22.6%**	**22.6%**	**23.3%**	**22.6%**	**22.6%**	**25.8%**	**26.7%**

Figure H.5 **Department of Civil Engineering: Academic Staff by Position with Percentage of Women, 2006–2007 to 2015–2016**



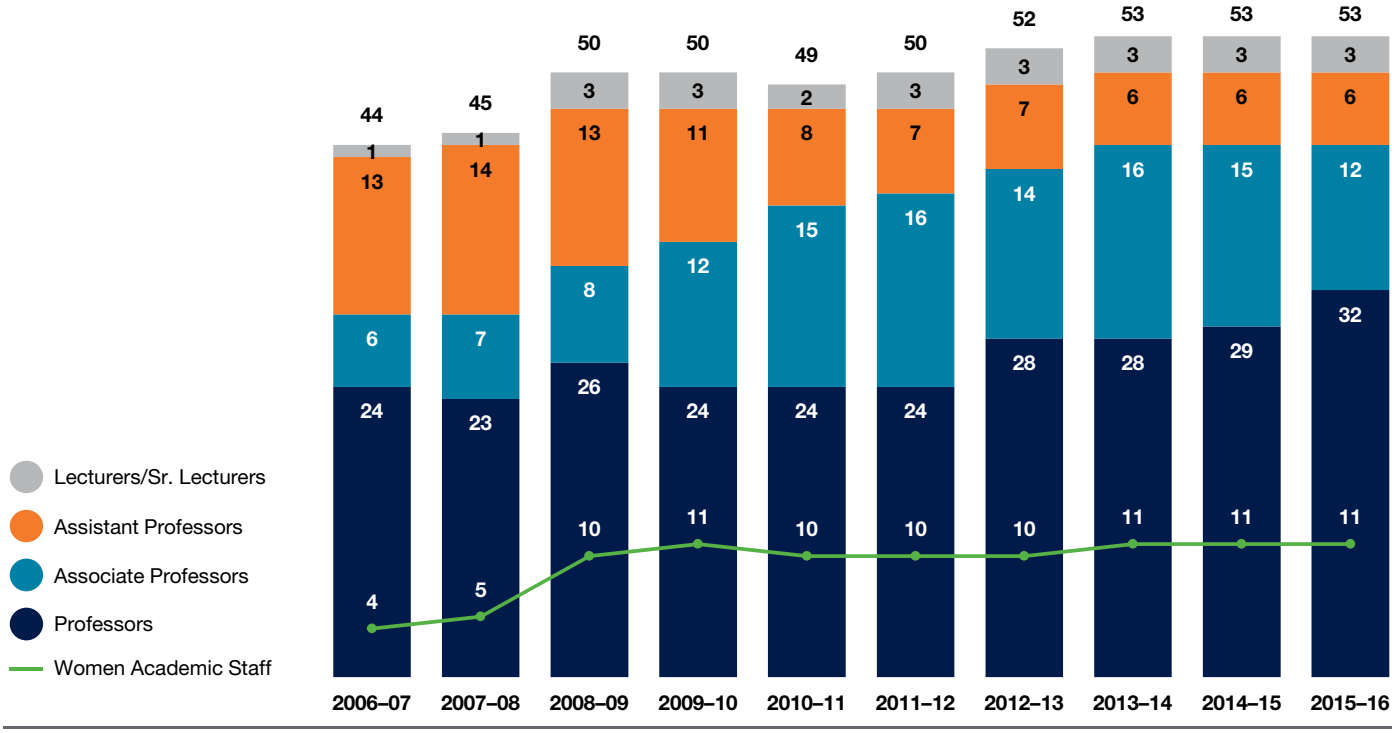
	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Assistant Professors	11	8	6	6	9	9	8	7	8	5
Women Assistant Professors	4	3	2	2	2	2	3	2	3	2
% Women Assistant Professors	**36.4%**	**37.5%**	**33.3%**	**33.3%**	**22.2%**	**22.2%**	**37.5%**	**28.6%**	**37.5%**	**40.0%**
Associate Professors	6	10	12	12	11	10	11	11	9	14
Women Associate Professors	1	2	3	3	3	2	2	3	2	4
% Women Associate Professors	**16.7%**	**20.0%**	**25.0%**	**25.0%**	**27.3%**	**20.0%**	**18.2%**	**27.3%**	**22.2%**	**28.6%**
Professors	15	15	15	15	17	19	17	16	18	20
Women Professors	0	0	0	0	0	1	1	1	2	3
% Women Professors	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**5.3%**	**5.9%**	**6.3%**	**11.1%**	**15.0%**
Lecturers/ Sr. Lecturers	0	1	1	1	1	1	1	1	1	1
Women Lecturers/ Sr. Lecturers	0	0	0	0	0	0	0	0	0	0
% Women Lecturers/ Sr. Lecturers	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total Tenured and Tenure Stream	32	33	33	33	37	38	36	34	35	39
Women Tenured and Tenure Stream	5	5	5	5	5	5	6	6	7	9
% Women Tenured and Tenure Stream	**15.6%**	**15.2%**	**15.2%**	**15.2%**	**13.5%**	**13.2%**	**16.7%**	**17.6%**	**20.0%**	**23.1%**
Total Academic Staff	32	34	34	34	38	39	37	35	36	40
Women Academic Staff	5	5	5	5	5	5	6	6	7	9
% Women Academic Staff	**15.6%**	**14.7%**	**14.7%**	**14.7%**	**13.2%**	**12.8%**	**16.2%**	**17.1%**	**19.4%**	**22.5%**

Figure H.6 **The Edward S. Rogers Sr. Department of Electrical & Computer Engineering: Academic Staff by Position with Percentage of Women, 2006–2007 to 2015–2016**



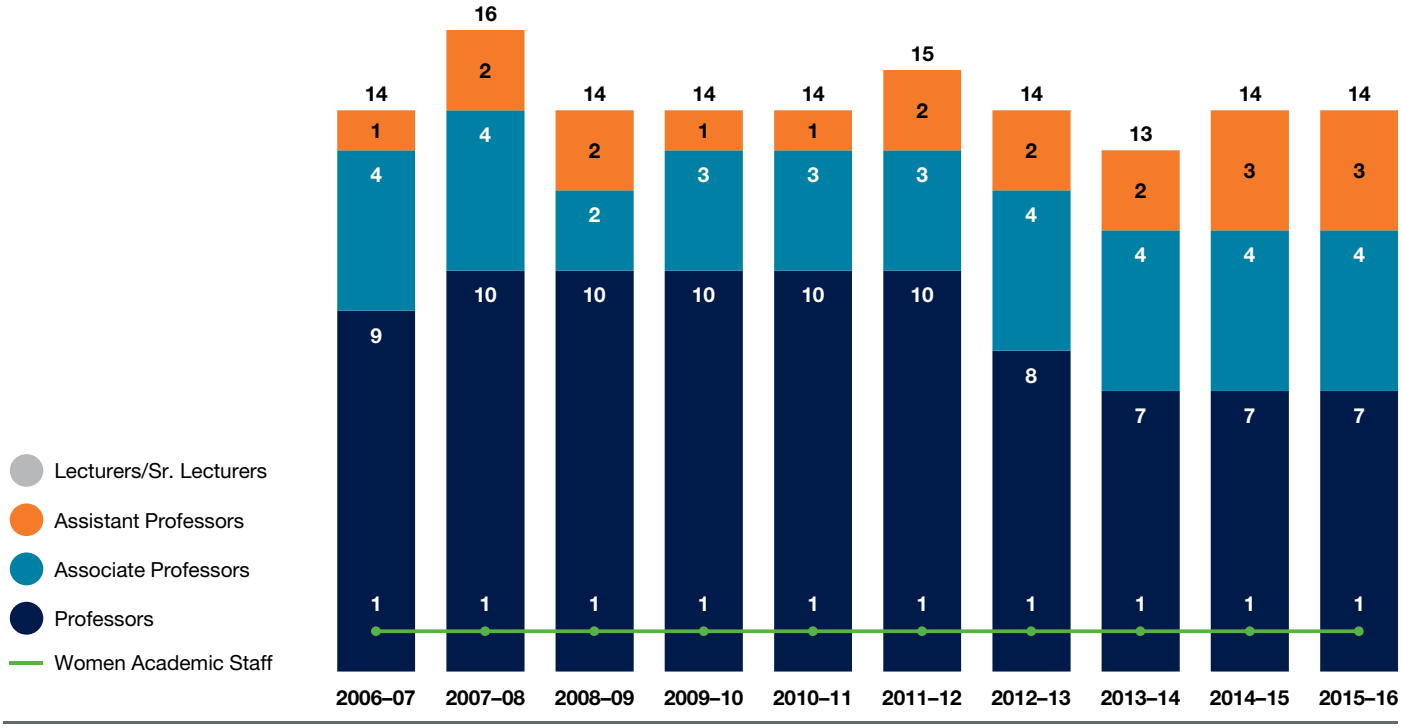
	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Assistant Professors	25	18	9	8	7	9	11	9	7	5
Women Assistant Professors	5	3	2	2	2	2	2	1	0	0
% Women Assistant Professors	**20.0%**	**16.7%**	**22.2%**	**25.0%**	**28.6%**	**22.2%**	**18.2%**	**11.1%**	**0.0%**	**0.0%**
Associate Professors	15	22	26	26	25	25	22	20	16	16
Women Associate Professors	0	1	3	4	4	4	4	4	4	3
% Women Associate Professors	**0.0%**	**4.5%**	**11.5%**	**15.4%**	**16.0%**	**16.0%**	**18.2%**	**20.0%**	**25.0%**	**18.8%**
Professors	30	25	30	32	34	34	39	43	49	50
Women Professors	0	0	0	0	0	0	1	2	3	4
% Women Professors	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**2.6%**	**4.7%**	**6.1%**	**8.0%**
Lecturers/ Sr. Lecturers	5	4	4	4	4	4	4	4	4	4
Women Lecturers/ Sr. Lecturers	1	1	1	1	1	1	1	1	1	1
% Women Lecturers/ Sr. Lecturers	**20.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**
Total Tenured and Tenure Stream	70	65	65	66	66	68	72	72	72	71
Women Tenured and Tenure Stream	5	4	5	6	6	6	7	7	7	7
% Women Tenured and Tenure Stream	**7.1%**	**6.2%**	**7.7%**	**9.1%**	**9.1%**	**8.8%**	**9.7%**	**9.7%**	**9.7%**	**9.9%**
Total Academic Staff	75	69	69	70	70	72	76	76	76	75
Women Academic Staff	6	5	6	7	7	7	8	8	8	8
% Women Academic Staff	**8.0%**	**7.2%**	**8.7%**	**10.0%**	**10.0%**	**9.7%**	**10.5%**	**10.5%**	**10.5%**	**10.7%**

Figure H.7 **Department of Mechanical & Industrial Engineering: Academic Staff by Position with Percentage of Women, 2006–2007 to 2015–2016**



	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Assistant Professors	13	14	13	11	8	7	7	6	6	6
Women Assistant Professors	0	1	5	6	5	5	4	2	2	1
% Women Assistant Professors	**0.0%**	**7.1%**	**38.5%**	**54.5%**	**62.5%**	**71.4%**	**57.1%**	**33.3%**	**33.3%**	**16.7%**
Associate Professors	6	7	8	12	15	16	14	16	15	12
Women Associate Professors	2	2	2	2	3	3	3	6	5	5
% Women Associate Professors	**33.3%**	**28.6%**	**25.0%**	**16.7%**	**20.0%**	**18.8%**	**21.4%**	**37.5%**	**33.3%**	**41.7%**
Professors	24	23	26	24	24	24	28	28	29	32
Women Professors	2	2	2	2	2	2	3	3	4	5
% Women Professors	**8.3%**	**8.7%**	**7.7%**	**8.3%**	**8.3%**	**8.3%**	**10.7%**	**10.7%**	**13.8%**	**15.6%**
Lecturers/ Sr. Lecturers	1	1	3	3	2	3	3	3	3	3
Women Lecturers/ Sr. Lecturers	0	0	1	1	0	0	0	0	0	0
% Women Lecturers/ Sr. Lecturers	**0.0%**	**0.0%**	**33.3%**	**33.3%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total Tenured and Tenure Stream	43	44	47	47	47	47	49	50	50	50
Women Tenured and Tenure Stream	4	5	9	10	10	10	10	11	11	11
% Women Tenured and Tenure Stream	**9.3%**	**11.4%**	**19.1%**	**21.3%**	**21.3%**	**21.3%**	**20.4%**	**22.0%**	**22.0%**	**22.0%**
Total Academic Staff	44	45	50	50	49	50	52	53	53	53
Women Academic Staff	4	5	10	11	10	10	10	11	11	11
% Women Academic Staff	**9.1%**	**11.1%**	**20.0%**	**22.0%**	**20.4%**	**20.0%**	**19.2%**	**20.8%**	**20.8%**	**20.8%**

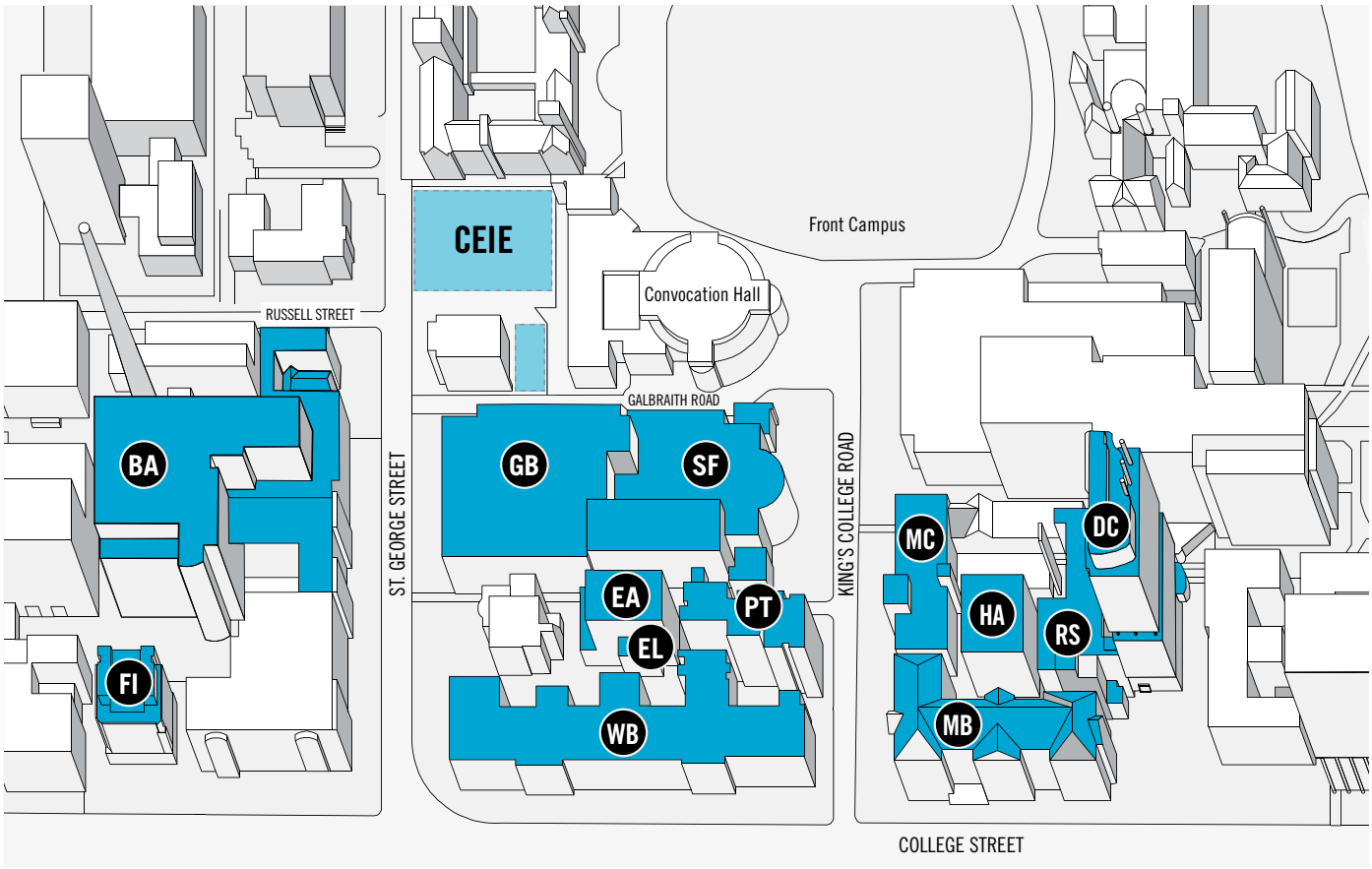
Figure H.8 **Department of Materials Science & Engineering: Academic Staff by Position with Percentage of Women, 2006–2007 to 2015–2016**



	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
Assistant Professors	1	2	2	1	1	2	2	2	3	3
Women Assistant Professors	0	0	0	0	0	0	0	0	0	0
% Women Assistant Professors	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Associate Professors	4	4	2	3	3	3	4	4	4	4
Women Associate Professors	1	1	1	1	1	1	1	1	1	1
% Women Associate Professors	**25.0%**	**25.0%**	**50.0%**	**33.3%**	**33.3%**	**33.3%**	**25.0%**	**25.0%**	**25.0%**	**25.0%**
Professors	9	10	10	10	10	10	8	7	7	7
Women Professors	0	0	0	0	0	0	0	0	0	0
% Women Professors	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Lecturers/ Sr. Lecturers	0	0	0	0	0	0	0	0	0	0
Women Lecturers/ Sr. Lecturers	0	0	0	0	0	0	0	0	0	0
% Women Lecturers/ Sr. Lecturers	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total Tenured and Tenure Stream	14	16	14	14	14	15	14	13	14	14
Women Tenured and Tenure Stream	1	1	1	1	1	1	1	1	1	1
% Women Tenured and Tenure Stream	**7.1%**	**6.3%**	**7.1%**	**7.1%**	**7.1%**	**6.7%**	**7.1%**	**7.7%**	**7.1%**	**7.1%**
Total Academic Staff	14	16	14	14	14	15	14	13	14	14
Women Academic Staff	1	1	1	1	1	1	1	1	1	1
% Women Academic Staff	**7.1%**	**6.3%**	**7.1%**	**7.1%**	**7.1%**	**6.7%**	**7.1%**	**7.7%**	**7.1%**	**7.1%**

Appendix I: The Engineering Precinct

The map below highlights buildings on the St. George campus that form the Engineering precinct. Most of our buildings reside on the southern-most part of campus. Along with UTIAS in Downsview, our offices at 256 McCaul Street, 704 Spadina Ave and the West Tower of MaRS Discovery District, these buildings house our students, faculty, staff, research and teaching spaces. For details on the buildings we occupy, please see *Chapter 11: Financial and Physical Resources*.



BA	Bahen Centre for Information Technology
DC	Donnelly Centre for Cellular and Biomolecular Research (CCBR)
EA	Engineering Annex / Electro-Metallurgy Lab Building (South Side)
EL	Electrometallurgy Lab
FI	Fields Institute
GB	Galbraith Building
HA	Haultain Building
MB	Lassonde Mining Building
MC	Mechanical Engineering Building
PT	D.L. Pratt Building
RS	Rosebrugh Building
SF	Sandford Fleming Building
WB	Wallberg Building
–	256 McCaul Street [not pictured]
–	704 Spadina Avenue [not pictured]
–	MaRS Discover District West Tower [not pictured]
–	UTIAS (Downsview) [not pictured]
CEIE	Centre for Engineering Innovation & Entrepreneurship (coming in 2017)

Data Sources

This section indicates the sources for data and information presented throughout this report. Sources are organized in order of appearance by figure number and title.

Figure	Data Source
	Faculty Leadership, 2015–2016 Information provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering. A current organizational chart is also available online at www.engineering.utoronto.ca/About/deans_office/Academic_Administrative_Leadership.htm
	Comparison of U of T Engineering with Ontario and Canada, 2015–2016 Enrolment, degrees granted and faculty data are based on the 2015 calendar year and come from the National Council of Deans of Engineering and Applied Science (NCDEAS) 2015 Resources Report, prepared by Engineers Canada and circulated to Canadian engineering deans in July 2016. Undergraduate enrolment figures exclude non-degree students and those doing a Professional Experience Year (PEY). Full-time equivalent (FTE) enrolment statistics represent averages that take into account all three terms of the year (winter, summer and fall). Undergraduate FTE shows the three-term total divided by two; Graduate FTE shows the three-term total divided by three. Research funding data comes from the Natural Sciences and Engineering Research Council (NSERC) search engine (www.nserc-crsng.gc.ca/ase-oro/index_eng.asp) with the following parameters: Selection Committees = Discovery Grants + Research Partnerships (excl CRCs & NCEs); Research Subjects = all engineering-related; Universities only; Fiscal Year = 2015–2016 (April to March). Major awards data comes from the Director, Awards and Honours, Faculty of Applied Science & Engineering, based on press releases and websites of individual awards for the 2015–2016 grant year (April to March).
	Comparison of U of T Engineering with St. George Campus and University of Toronto, 2015–2016 All student enrolment statistics are based on headcount for Fall 2015 from the U of T Enrolment Reporting Cube (St. George and U of T statistics do not include Toronto School of Theology). All degrees awarded statistics come from ROSI and reflect September 2015 to June 2016 dates (St. George and U of T statistics do not include Toronto School of Theology). All sponsored-research funding statistics come from the U of T Research Reporting Cube, based on 2014–2015 grant year and exclude partner hospitals; includes all program types; data current as of May 2016. Engineering academic staff statistics provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering (based on HRIS and published lists of faculty members). Engineering administrative and technical staff statistic from 2015 Resources Survey prepared by Engineers Canada for NCDEAS (based on calendar year). U of T academic and administrative staff statistics come from U of T Facts and Figures 2015. Engineering total revenue provided by Chief Financial Officer, Faculty of Applied Science & Engineering. U of T total revenue provided by the Office of the Vice-Provost, Planning & Budget. Engineering space statistic from U of T Office of Space Management data, January 2016. U of T and St. George space statistics from U of T Facts and Figures 2015, which is available online at: https://www.utoronto.ca/sites/default/files/Facts_Figures_2015_online_entire_book.pdf

Chapter 1: **Undergraduate Studies**

1.1a	**Applications, Offers, Registrations, Selectivity and Yield of First-Year Undergraduates, 2005 to 2014** All years data for applications and offers are based on annual Admissions Committee reports to Faculty Council (November), counting new admissions only, FT and PT, all years of study. Excludes students with special status. Registrations only are from U of T Undergraduate Enrolment Reporting Cube. Cube Parameters: Faculty = Faculty of Applied Science & Engineering, All Fall Terms for 2006–2015, Degree Type = Undergraduate; Stage of Study (SESLEV) = Year 1, New Intake (NEWINTK) = Yes, Measure = Headcount.
1.1b	**Applications, Offers, Registrations, Selectivity and Yield of International First-Year Undergraduates, 2006 to 2015** All years data for applications and offers are based on annual Admissions Committee reports to Faculty Council (November), counting new admissions only, FT and PT, all years of study. Excludes students with special status. Registrations only are from U of T Undergraduate Enrolment Reporting Cube. Cube Parameters: Faculty = Faculty of Applied Science & Engineering, All Fall Terms for 2006–2015, Degree Type = Undergraduate; Stage of Study (SESLEV) = Year 1, New Intake (NEWINTK) = Yes, Domestic / International (DOM_INTL) = International; Measure = Headcount.

1.1c Applications, Offers, Registrations, Selectivity and Yield of International First-Year Undergraduates, 2006 to 2015

All years data for applications and offers are based on annual Admissions Committee reports to Faculty Council (November), counting new admissions only, FT and PT, all years of study. Excludes students with special status. Registrations only are from U of T Undergraduate Enrolment Reporting Cube. Cube Parameters: Faculty = Faculty of Applied Science & Engineering, All Fall Terms for 2006–2015, Degree Type = Undergraduate; Stage of Study (SESLEV) = Year 1, New Intake (NEWINTK) = Yes, Domestic / International (DOM_INTL) = International; Measure = Headcount.

1.2 Ontario Secondary School Averages of Incoming First-Year Undergraduates and Retention Rate Between First and Second Year, 2006 to 2015

Averages of incoming first-year students from Admissions Committee Report to Faculty Council (November). Retention rates based on Undergraduate Enrolment Projections, published by the U of T Planning and Budget Office, October 2015 and January 2016.

1.3 Incoming First-Year Undergraduates with Percentage of Women and International Students, 2006 to 2015

Headcount from U of T Undergraduate Enrolment Cube. Excludes students with special status. Cube Parameters: All Fall Terms for 2006–2015; Degree Type = Undergraduate; New Intake (NEWINTK) = Yes; Measure = Headcount; [Gender] and [DOM_INTL] parameters used to calculate percentages of women and international students, respectively.

1.4 Incoming First-Year Domestic and International Undergraduates, 2006 to 2015

Headcount from University of Toronto Enrolment Master Files, the source of U of T Reporting Cube. Includes new and returning students. Excludes students with special status. Cube Parameters: All Fall Terms for 2006–2015; Stage of Study (SESLEV) = Year 1; New Intake (NEWINTK) = Yes; Degree Type = Undergraduate; Measure = Headcount

1.5a Undergraduate Enrolment with Proportion of Women and International Students, 2006–2007 to 2015–2016

Headcount from U of T Undergraduate Enrolment Reporting Cube. Excludes students with special status. Cube Parameters: All Fall Terms for 2006–2015; Degree Type = Undergraduate; Measure = Headcount; [Gender] and [DOM_INTL] parameters used to calculate percentages of women and international students, respectively.

1.5b Women as a Proportion of Total Enrolment by Program, 2006–2007 to 2015–2016

Headcount from U of T Undergraduate Enrolment Reporting Cube. Excludes students with special status. Cube Parameters: Fall Terms for 2006–2015; Degree Type = Undergraduate; Gender = Female; Departments based on [Programs] field

1.6 Undergraduates by Program, Year of Study and Professional Experience Year (PEY), 2015–2016

Headcount from U of T Undergraduate Enrolment Reporting Cube. Includes full-time students, part-time students and students on PEY internship. Excludes students with special status. Cube Parameters: Years 1–4; Fall 2015; Departments based on [Programs] field; Degree Type = Undergraduate.

1.7 Undergraduates by Program, 2006–2007 to 2015–2016

Headcount from U of T Undergraduate Enrolment Reporting Cube. Includes full-time students, part-time students and students on PEY internship. Excludes students with special status. Cube Parameters: All Fall Terms for 2006–2015; Years 1–4 (SESLEV); Degree Type = Undergraduate; Measure = Headcount; Departments based on [Programs] field.

1.8a Number of Awards Received by Cohort with Total Number of Undergraduate Need-Based Award Recipients, 2009–2010 to 2015–2016

Award data from U of T Student Accounts Cube. Parameters: Transaction Type = Income / Awards – Undergrad; Need-based; Level of Instruction = Undergrad; Enrolment Status = All (e.g. FINCA, CANC, etc.); Year of Study = 1-4 (exclude any N/A); Sessions: include most recent (current) academic year (even without Summer; summer = mostly CIE exchange funding); Measure = Dollar amount

1.8b Total Value of Undergraduate Need-Based Awards and Percentage Distributed by Year of Study, 2009–2010 to 2015–2016

Award data from U of T Student Accounts Cube. Parameters: Transaction Type = Income / Awards – Undergrad; Need-based; Level of Instruction = Undergrad; Enrolment Status = All (e.g. FINCA, CANC, etc.); Year of Study = 1-4 (exclude any N/A); Sessions: include most recent (current) academic year (even without Summer; summer = mostly CIE exchange funding); Measure = Distinct student count

1.9a **Undergraduate Degrees Awarded by Program, 2006–2007 to 2015–2016**
All data from ROSI download: 5EA (Graduated Students); Faculty = Faculty of Applied Science & Engineering.

1.9b **U of T Engineering Degrees Awarded by Academic Area Compared with Canadian, and North American Degree Totals, 2014**
U of T and Canadian statistics are based on the 2014 calendar year and come from Engineers Canada Report of Enrolment & Degrees Granted *(Canadian Engineers for Tomorrow, Trends in Engineering Enrolment and Degrees Awarded 2010-2014),* released November 2015, and available online at: https://www.engineerscanada.ca/sites/default/files/EnrolmentReport2014-e-r2.pdf. American statistics used to calculate North American percentages are based on the 2014–2015 academic year and come from the 2015 American Society of Engineering Educators (ASEE) Report, available online at: www.asee.org/papers-and-publications/publications/college-profiles

1.10 **Undergraduate Students per Faculty Member by Academic Area, 2015–2016**
Number of undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY internship and students with special status. Cube Parameters: Fall 2015, Degree Type = Undergraduate; AssocOrg = blank (to exclude PEYs); Measure = Headcount. Faculty Total does not include teaching done for Engineering by extra-divisional units (especially Arts & Science departments). Results are not adjusted for departmental contributions to shared first-year curriculum, Engineering Science or Engineering minors. Faculty counts provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering and used on a slip-year basis: totals from July 2015 are used to compare with 2015-16 student counts. Calculation includes tenured / tenure-stream and lecturers / teaching stream faculty.

1.11a **Number of Students and Percentage of Class Graduating with Honours, 2007 to 2016**
Data provided by the Office of the Faculty Registrar, Faculty of Applied Science & Engineering.

1.11b **Number of Students on the Dean's Honour List by Term and Academic Area, 2011–2012 to 2015–2016**
Statistics provided by Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.

Text **Pre-University Engineering Outreach**
Information and statistics provided by the Associate Director, Engineering Student Outreach Office, Faculty of Applied Science & Engineering.

Chapter 2: **Graduate Studies**

2.1a **International and Domestic Graduate Students by Degree Type with Percentage of International Students,2006–2007 to 2015–2016**
Enrolment counts are from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: All Fall Terms for 2006–2015, Measure = Headcount. [DOM_INTL] parameter used to calculate percentage of international students.

2.1b **Graduate Students by Degree Type and Gender with Percentage of Women Students, 2006–2007 to 2015–2016**
Enrolment counts are from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: All Fall Terms for 2006–2015; Measure = Headcount. Gender parameter used to calculate percentage of women.

2.1c **Graduate Student Enrolment by Full-Time Equivalent (FTE) and Headcount (HC) by Academic Area, 2006–2007 to 2015–2016**
Enrolment counts are from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: Measure = Headcount or Total FTE (UAR). Headcounts are reported for all fall terms from 2006–2015. FTEs are counted by academic year as reported in the cube (May to April).

2.1d **Comparison of MASc and MEng/MHSc Full-Time Equivalent Enrolment Trends 2006–2007 to 2015–2016**
Enrolment counts are from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: All Fall Terms for 2006–2015; Measure = Total FTE (UAR).

2.2a Undergraduate and Graduate Full-Time Equivalent Students per Faculty Member, 2006–2007 to 2015–2016

Number of FTE undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY internship and students with special status. Cube Parameters: Fall terms 2006–2015; AssocOrg = blank (to exclude PEY); Degree Type = Undergraduate; Measure = Headcount. To calculate Undergraduate FTEs, part-time students are counted as 0.3 FTE. Number of FTE graduate students from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Fall terms 2006–2015; Measure = Total FTE (UAR); excludes students with special status. Number of faculty included in the calculation provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering and used on a slip-year basis: totals from July 2015 are used to compare with 2015-16 student counts. Graduate ratios include only tenured and tenure-stream faculty; Undergraduate ratios also include lecturers / teaching stream faculty.

2.2b Ratio of Undergraduate to Graduate Full-Time Equivalent Students, 2006–2007 to 2015–2016

Number of FTE undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY internship and students with special status. Cube Parameters: Fall terms 2006–2015; AssocOrg = blank (to exclude PEY); Degree Type = Undergraduate; Measure = Headcount. To calculate Undergraduate FTEs, part-time students are counted as 0.3 FTE. Number of FTE graduate students from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Fall terms 2006–2015; Measure = Total FTE (UAR); Includes all degree types but excludes students with special status.

2.2c Full-Time Equivalent Graduate Students per Faculty Member by Academic Area and Degree Type, 2015–2016

Number of FTE graduate students from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Fall 2015; Measure = Total FTE (UAR). Includes all degree types but excludes students with special status. The number of graduate students per department is adjusted as per the budget calculation for inter-departmental graduate student supervision. Faculty counts are provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering, and are used on a slip-year basis: totals from July 2015 are used to compare with 2015-16 student counts. Includes tenured and tenure-stream faculty only.

2.3 Applications, Offers, Registrations, Selectivity and Yield of PhD Students, 2006–2007 to 2015–2016

All data from ROSI download: 4BEG (Admissions Statistics). Students who have fast-tracked from MASc programs into PhD programs are calculated separately (see Fig. 2.8a) but have been included in this figure as applications, offers and admissions in order to more accurately reflect total PhD student intake. This is a change from previous annual reports.

2.4 Applications, Offers, Registrations, Selectivity and Yield of MASc Students, 2006–2007 to 2015–2016

All data from ROSI download: 4BEG (Admissions Statistics)

2.5 Applications, Offers, Registrations, Selectivity and Yield of MEng and MHSc Students, 2006–2007 to 2015–2016

All data from ROSI download: 4BEG (Admissions Statistics).

2.6a Graduate Student Funding by Category, 2005–2006 to 2014–2015

Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Parameters: include Awards-Grad, Stipend, UT Employment; exclude Awards-Undergrad, Waiver. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. Parameters: include funding from all sources except work-study employment income. Student funding reported by academic year (September to August).

2.6b Graduate Student Funding by Category and Academic Area, 2014–2015

Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Parameters: include Awards-Grad, Stipend, UT Employment; exclude Awards-Undergrad, Waiver. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. Parameters: include funding from all sources except work-study employment income. Student funding reported by academic year (September to August).

2.7a Total External Graduate Student Scholarships by Source, 2005–2006 to 2014–2015

Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Parameters: Transaction Type = Income / Awards – Grad; Award Income Source = External. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. Parameters: Award Income only. Student funding reported by academic year (September to August).

2.7b Number of NSERC Graduate Student Award Recipients by Academic Area, 2005–2006 to 2014–2015

Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Parameters: Transaction Type = Income / Awards – Grad; Award Income Source = Federal — Natural Sciences and Engineering Research Council. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. Parameters: Award Income only. Source = Federal — Natural Sciences and Engineering Research Council. Measure = Student Count. Student funding reported by academic year (September to August).

2.8a **Number of Students Fast-Tracked from MASc to PhD by Academic Area, 2006–2007 to 2015–2016**
All data from ROSI download: 4FF (Student Registrations). Fast-tracked students are identified by POSt codes that end in 'PHD U' and are counted when prior session POSt code was a master's degree (MASc or MEng). To reflect fast-tracking practice, an academic year is considered to be Summer-Fall-Winter (May to April).

2.8b **Number of Direct-Entry PhD Students by Academic Area, 2008–2009 to 2015–2016**
All data from ROSI download: 4FF (Student Registrations). Include all PhD students where prior session POSt code was blank or AE NDEGP (recently-complete UGrad). Reported by academic year defined as Summer-Fall-Winter (May to April).

2.9 **Time to Graduation for PhD, MASc, MEng and MHSc Graduate Students, 2006–2007 to 2015–2016**
All data from ROSI download: 4BEA (Years to Graduate), originally created for Ontario Council of Graduate Studies (OCGS) reporting purposes. The data reflects median values based on the total number of terms in which a student is registered. Leaves, lapses and (in most cases) the term in which the convocation occurs are excluded. Where a student is fast-tracked from the MASc into a PhD, the total time for both programs is counted. Full-time, extended full-time and part-time MEng students are distinguished for greater clarity and accuracy.

2.10 **Graduate Degrees Awarded by Degree Type and Gender, 2006–2007 to 2015–2016**
All data from ROSI download: 5EA (Graduated Students); Faculty = Faculty of Applied Science & Engineering.

Text **Enriching the Graduate Student Experience**
Information provided by the Vice-Dean Graduate Studies, Faculty of Applied Science & Engineering.

2.11 **ELITE Certificates Awarded, 2008–2009 to 2015–2016**
ELITE eligibility based on year of graduation and successful completion of a minimum of 4 ELITE-designated courses. Eligibility criteria and course listing provided by the Vice-Dean Graduate Studies, Faculty of Applied Science & Engineering.

2.12 **MEng, SCFI Program Enrolment, Fall 2008 to Winter 2016**
Information provided by the Graduate Program Administrator, Department of Mechanical & Industrial Engineering.

Chapter 3: **Research**

Text **Selected Research Highlights for 2015–2016**
Information provided by Vice-Dean Research, Faculty of Applied Science & Engineering.

3.1a **Breakdown of Research Infrastructure Funding vs. Research Operating Funding, 2005–2006 to 2014–2015**
Data from the U of T Research Reporting Cube. Current as of May 2016. Organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015). Infrastructure funding includes the Canada Foundation for Innovation (except the CFI Career Award), the Ontario Research Fund (ORF) and the NSERC Research Tools and Instruments (RTI) Program.

3.1b **Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC) and Networks of Centres of Excellence (NCE) Funding, 2005–2006 to 2014–2015**
Data from the U of T Research Reporting Cube. Current as of May 2016. Organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015).

3.1c **Research Operating Funding by Year, Source and Funding per Faculty Member, 2005–2006 to 2014–2015**
Data is from the U of T Research Reporting Cube, current as of May 2016, and is organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015). Research Operating Funding excludes the following infrastructure programs: Canada Foundation for Innovation (except the CFI Career Award), the Ontario Innovation Trust, the Ontario Research Fund (ORF) – Research Infrastructure and the NSERC Research Tools and Instruments (RTI) Program. Faculty data is provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering, and here includes tenured and tenure-stream faculty only, as reported each July. Faculty counts are used on a slip-year basis: e.g. those reported in July 2014 (for academic year 2013-14) are linked to Grant Year 2015 (Apr 2014 - Mar 2015).

3.2a **NSERC Funding, 2014–2015**
Data from the U of T Research Reporting Cube. Current as of May 2016. Organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015). Sponsor = Three Councils / Natural Sciences & Engineering. Year = 2015.

3.2b **NSERC Industrial Partnership Funding by Program, 2005–2006 to 2014–2015**
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3.2c **Industrial Partnerships as a Proportion of Total NSERC Funding, 2005–2006 to 2014–2015**
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3.2d **Industry Partners, 2015–2016**
Data from the U of T Research Reporting Cube. Current as of May 2016. Organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015). Sponsor = Corporate. Additional information gathered from selected websites (e.g. those of Industrial Research Chairs and major research consortia) and provided by individual departments within the Faculty of Applied Science & Engineering.

3.2e **NSERC Research Grant Funding by Program, 2005–2006 to 2014–2015**
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All data from NSERC Award Search Engine: www.nserc-crsng.gc.ca/ase-oro/index_eng.asp. Based on Selection Committees for Discovery and Partnership Programs, but not Scholarships and Fellowships. Organized by grant year. Excludes Canada Research Chairs and Networks of Centres of Excellence and does not include Indirect Costs of Research. Organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015).

3.3b **U of T Annual Share of NSERC Funding in Engineering, 2005–2006 to 2014–2015**
All data from NSERC Award Search Engine: www.nserc-crsng.gc.ca/ase-oro/index_eng.asp. Based on Selection Committees for Discovery and Partnership Programs, but not Scholarships and Fellowships. Organized by grant year. Excludes Canada Research Chairs and Networks of Centres of Excellence and does not include Indirect Costs of Research. Organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015).

3.4a **Engineering Invention Disclosures by Academic Area, 2011–2012 to 2015–2016**
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3.4b **U of T Invention Disclosures by Faculty, 2015–2016**
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3.4c **U of T Patent Applications by Faculty, 2015–2016**
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3.5 **Distribution of Research Operating Funding by Academic Area, 2005–2006 to 2014–2015**
Data from the U of T Research Reporting Cube. Current as of May 2016. Organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015). Research Operating Funding excludes the following infrastructure programs: Canada Foundation for Innovation (except the CFI Career Award), the Ontario Innovation Trust, the Ontario Research Fund (ORF) – Research Infrastructure and the NSERC Research Tools and Instruments (RTI) Program.

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Information provided by the Cross-Disciplinary Programs Office, Faculty of Applied Science & Engineering.

4.1a **Number of Students and Percentage of Graduating Class Completing an Engineering Minor, 2006–2007 to 2015–2016**
Information provided by the Cross-Disciplinary Programs Office, Faculty of Applied Science & Engineering.

4.1b **Students Graduating with an Engineering Business Minor or Certificate, 2011–2012 to 2015–2016**
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4.2b **Undergraduate Participation in Summer Research Opportunities by Academic Area, 2016**
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4.3a **PEY Internship Placements for Engineering Undergraduates with Percentage Participation from Previous Third-Year Class, 2006–2007 to 2015–2016**
Statistics provided by the Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.

4.3b **Canadian and International PEY Internship Placements for Engineering Undergraduates, 2006–2007 to 2015–2016**
Statistics provided by the Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.

4.3c **PEY Employers who Hired Engineering Students, 2009–2010 to 2015–2016**
Statistics provided by the Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.

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Information provided by the Director, Engineering Communications Program.

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5.2a **Number of Major National and International Awards Received by U of T Engineering Compared to Other Canadian Engineering Faculties, 2015**
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5.3 **Number of Awards Received by U of T Engineering Faculty Compared to Other Canadian Engineering Faculties, 2011 to 2015**
Information provided by the Director, Awards and Honours, Faculty of Applied Science & Engineering.

Text **Selected Awards Received by Faculty Members and Alumni**
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Information provided by the Director, Awards and Honours, Faculty of Applied Science & Engineering.

Text **University of Toronto Engineering Faculty Awards**
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Text **Engineering Alumni Association Awards**
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Shanghai Jiao Tong Academic Ranking of World Universities (ARWU) for Engineering/ Technology and Computer Sciences

6.1a **ARWU Top 50 World Universities, 2015**
Data from ARWU website: www.shanghairanking.com/FieldENG2015.html.

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6.1d **Scoring Analysis of Canadian U15 Universities in ARWU Top 100, 2015**
Data from ARWU website: www.shanghairanking.com/FieldENG2015.html.

Times Higher Education (THE)–Elsevier World University Ranking for Engineering and Information Technology

6.2a **THE Top 50 World Universities, 2015**
Data from THE World University Ranking website: www.timeshighereducation.co.uk/world-university-rankings/2015-16/subject-ranking/subject/engineering-and-IT

6.2b **THE Top North American Public Universities, 2015**
Data from THE World University Ranking website: www.timeshighereducation.co.uk/world-university-rankings/2015-16/subject-ranking/subject/engineering-and-IT

6.2c **Canadian U15 Universities in THE Top 100, 2015**
Data from THE World University Ranking website: www.timeshighereducation.co.uk/world-university-rankings/2015-16/subject-ranking/subject/engineering-and-IT

QS World University Rankings for Engineering and Information Technology

6.3a **QS Top 50 World Universities, 2015**
Data from QS World University Ranking website: www.topuniversities.com/university-rankings/faculty-rankings/engineering-and-technology/2015

6.3b **QS Top North American Public Universities, 2015**
Data from QS World University Ranking website: www.topuniversities.com/university-rankings/faculty-rankings/engineering-and-technology/2015

6.3c **Canadian U15 Universities in QS Top 200, 2015**
Data from QS World University Ranking website: www.topuniversities.com/university-rankings/faculty-rankings/engineering-and-technology/2015

6.3d **Canadian Universities in QS by Subject, 2016**
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National Taiwan University (NTU) Performance Ranking of Engineering Papers

6.4a **NTU Top 50 World Universities, 2015**
Data from National Taiwan University Performance Ranking of Scientific Papers for World Universities 2015 website: http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Engineering&y=2015. Data compiled from Thomson Reuters' science citation indexes.

6.4b NTU Top North American Public Universities, 2015
Data from National Taiwan University Performance Ranking of Scientific Papers for World Universities 2015 website: http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Engineering&y=2015. Data compiled from Thomson Reuters' science citation indexes.

6.4c Canadian U15 Universities in NTU Top 200, 2015
Data from National Taiwan University Performance Ranking of Scientific Papers for World Universities 2015 website: http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Engineering&y=2015. Data compiled from Thomson Reuters' science citation indexes.

6.4d Canadian Universities in NTU by Subject, 2015
Data from National Taiwan University Performance Ranking of Scientific Papers for World Universities 2015 website: http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Engineering&y=2015. Data compiled from Thomson Reuters' science citation indexes.

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6.5a Number of Engineering Publications Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2010 to 2014
Data from Thomson Reuters University Science Indicators 2014 Standard Edition, covering 2010 to 2014. Includes public peer institutions in Canada (U15) and U.S. (AAU plus University of California at San Francisco).

6.5b Summary of U15 Bibliometrics for Publications
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6.6a Number of Engineering Citations Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2010 to 2014
Data from Thomson Reuters University Science Indicators 2014 Standard Edition, covering 2010 to 2014. Includes public peer institutions in Canada (U15) and U.S. (AAU plus University of California at San Francisco).

6.6b Summary of U15 Bibliometrics for Citations
Data from Thomson Reuters University Science Indicators 2014 Standard Edition, covering 2010 to 2014. Includes public peer institutions in Canada (U15) and U.S. (AAU plus University of California at San Francisco). Faculty counts for analysis of U15 citations per faculty member are from the Engineers Canada 2014 Resources Report.

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7.1b Philanthropic Support, 2006–2007 to 2015–2016
Statistics provided by the Office of Advancement and Alumni Relations, Faculty of Applied Science & Engineering.

7.1c Gift Designations, 2015–2016
Statistics provided by the Office of Advancement and Alumni Relations, Faculty of Applied Science & Engineering.

7.1d Graditude Participation, 2009–2010 to 2015–2016
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Text **Initiatives and Projects, 2015–2016**
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8.1a **Proportion of U of T Engineering Media Stories by Outlet Location, 2015–2016**
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Statistics provided by University of Toronto Strategic Communications. Data represents information collected between May 2015 and April 2016.

8.1c **Proportion of U of T Engineering Impressions by Academic Area, 2015–2016**
Statistics provided by University of Toronto Strategic Communications. Data represents information collected between May 2015 and April 2016.

8.2 **Top Stories on the Engineering News and U of T News Websites, 2015–2016**
Statistics provided by University of Toronto Strategic Communications. Data represents information collected between May 2015 and April 2016.

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Information provided by Engineering Strategic Communications, Faculty of Applied Science & Engineering.

8.3a **Summary of Analytics for Faculty and News Sites, 2015–2016**
Websites: engineering.utoronto.ca and news.engineering.utoronto.ca. Website statistics sourced from Google Analytics.

8.3b **Summary of Analytics for You Belong Here Microsite, Nov. 25, 2015 to April 30, 2016**
Website: www.admit.engineering.utoronto.ca/next-steps. Website statistics sourced from Google Analytics.

8.4 **Visitors to discover.engineering.utoronto.ca: Top 10 Countries, 2015–2016**
Website: discover.engineering.utoronto.ca. Website statistics sourced from Google Analytics.

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9.1a **Selected Opportunities for International Students to Study at U of T Engineering**
Information provided by the Director, Centre for International Experience, University of Toronto.

9.1b **Selected Opportunities for U of T Engineering Students to Study or Work Abroad**
Information provided by the Director, Centre for International Experience, University of Toronto.

Text **Selected International Educational and Research Partnerships**
Information taken from *The Engineering Newsletter,* Faculty of Applied Science & Engineering.

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10.2 **Percentage of Women Students and Faculty, 2006–2007 to 2015–2016**
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10.3 **Total Number of Faculty with Percentage of Women, 2006–2007 or 2015–2016**
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10.4 **Percentage of Women Faculty at U of T Engineering compared with Women Faculty in Ontario and Canadian Engineering Faculties, 2015–2016**
Information from 2015 Resources Survey prepared by Engineers Canada for the National Council of Deans of Engineering and Applied Science. Data represents November 15, 2015 counts.

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Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

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11.4 **Revenue Sources, 2015–2016**
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11.6 **Total Operating Budget: Breakdown by Expense, 2015–2016 (net of central university costs)**
Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

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Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

11.7 **Summary of Buildings Occupied by the Faculty of Applied Science & Engineering, 2015–2016**
Data provided by Director, Facilities & Infrastructure Planning, Faculty of Applied Science & Engineering.

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Information provided by Director, Facilities & Infrastructure Planning, Faculty of Applied Science & Engineering.

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Information provided by Director, Facilities & Infrastructure Planning, Faculty of Applied Science & Engineering.

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A Engineering Student Clubs and Teams

Information from the Engineering Society: www.skule.ca.

B Outreach Programs

Information provided by Engineering Student Outreach Office, Faculty of Applied Science & Engineering.

C Time to Completion for Graduate Students

All data from ROSI 4BEA downloads (Years to Graduate), originally created for Ontario Council of Graduate Studies (OCGS) reporting purposes. The data reflects median values based on the total number of terms in which a student is registered. Leaves, lapses and (in most cases) the term in which the convocation occurs are excluded. Where a student is fast-tracked from the MASc into a PhD, the total time for both programs is counted. Full-time, extended full-time and part-time MEng students are distinguished for greater clarity and accuracy.

D Research Chairs

Chairholders are reported as of the HR turnover date at the end of the reporting cycle, in this case, July 1, 2015, except in cases where new allocations (e.g., CRCs) have not yet been made public. List compiled from the following sources:

- Canada Research Chairs website: www.chairs-chaires.gc.ca/home-accueil-eng.aspx
- Industrial Research Chairs website: www.nserc-crsng.gc.ca/Professors-Professeurs/CFS-PCP/IRC-PCI_eng.asp
- Office of Advancement, Faculty of Applied Science & Engineering
- Office of the Vice-Dean, Research, Faculty of Applied Science & Engineering
- Assistant Dean, Administration, Faculty of Applied Science & Engineering
- Distinguished Professors and University Professors from the Office of the Vice-President & Provost websites: www.provost.utoronto.ca/awards/Distinguished_Professors.htm and www.provost.utoronto.ca/Awards/uprofessors.htm

Chairholders are reported as of the HR turnover date at the end of the reporting cycle, in this case, July 1, 2016, except in cases where new allocations (e.g. CRCs) have not yet been made public.

E Research Funding by Academic Area

Data is from the U of T Research Reporting Cube, current as of May 2016, and is organized by grant year (e.g., 2014–2015 = April 2014 to March 2015 = Grant Year 2015). Research Operating Funding excludes the following infrastructure programs: Canada Foundation for Innovation (except the CFI Career Award), the Ontario Innovation Trust, the Ontario Research Fund (ORF) – Research Infrastructure and the NSERC Research Tools and Instruments (RTI) Program. Faculty data is provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering, and here includes tenured and tenure-stream faculty only, as reported each July. Faculty counts are used on a slip-year basis: e.g. those reported in July 2014 (for academic year 2013-14) are linked to Grant Year 2015 (Apr 2014 - Mar 2015).

F Spinoff Companies

Report of U of T Commercialization Indicators, Annual Supplement for FY2016, provided by the Office of the Vice President, Research. Data current as of May 1, 2016.

G Descriptions of Major Awards

Information from the Director, Awards and Honours, Faculty of Applied Science & Engineering.

H Academic Staff by Academic Area

Information provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering. Women academic staff include all ranks of professor plus lecturers/senior lecturers.

I The Engineering Precinct

Information from Office of Space Management. Visit map.utoronto.ca for a full campus map.

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

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