



**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE & ENGINEERING**

**Academic Plan 2011–2016**  
**Final Report on Progress and**  
**Achievements**

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# 1. Executive Summary

Five years ago, our Faculty approved our Academic Plan 2011-2016, which outlined strategic goals in key areas of: culture of excellence; positioning; educating future engineers; student experience; research foci; outreach, collaboration and influence; and resource allocation. We have made tremendous progress in achieving, and surpassing, these goals and are pleased to present an overview of our accomplishments in this final report.

As the top Canadian engineering school in all international rankings, we continue to attract high calibre students to our programs. Through strategic recruitment events, outreach activities, and targeted communications, we are building an awareness of the essential role engineers play in the world today including among underrepresented groups. Applications to our undergraduate programs increased by 65 per cent in the past five years, with one place now available for every 12 applicants. Graduate enrolment rose to 2,364, surpassing our goal of 2,000 three years ahead of schedule. Our cultural and gender diversity grew at a remarkable rate. International students now comprise 27.9 per cent of undergraduates and 33.7 per cent of graduate students compared to 19.1 per cent and 19.3 per cent, respectively, in 2011-2012. While female student growth was modest in our master's and PhD programs, 26.1 per cent compared to 24.9 per cent in 2011-2012, we have had tremendous growth in our incoming undergraduate cohorts. Women make up 40.1 per cent of our first-year class in 2016-2017, up from 23.2 per cent in 2011-2012, and they now comprise 30.0 per cent of total undergraduates. We have also made significant progress in increasing gender diversity in our professoriate, adding 18 talented women professors to our ranks in the past five years and bringing us to 21.0 per cent, compared to 9.5 per cent a decade ago.

Our Faculty has developed a number of pathways to enhance multidisciplinary collaboration in education and to further integrate professional competencies, such as global engineering and cultural fluency, entrepreneurship, leadership and communication into undergraduate and graduate curricula. We expanded the number of undergraduate minor and certificate options to 15, and added 11 graduate certificates/emphases since the creation of the Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) in 2007. Several of these are cross-disciplinary, including: the Engineering Business Minor, Renewal Resources Engineering Certificate, Sustainable Energy emphasis and Advanced Technologies & Process Design emphasis. Entrepreneurship has played an increasing role in our Faculty within the past five years with the launch of The Entrepreneurship Hatchery and Start@UTIAS, our two in-house incubators that provide mentoring, networking, seed funding and other resources to undergraduate and graduate

students who are interested in developing technology businesses. Since 2013, the Hatchery has helped launch 37 start-ups.

We surpassed, three years early, our original goal of increasing annual Tri-Council funding to \$25 million by 2015 and are approaching our revised goal of \$32 million. According to the most recent complete data (2014-2015), we have reached \$31.8 million. This has enabled us to increase our allocation of Canada Research Chairs to 29. We also made tremendous advances in furthering multidisciplinary research collaborations both within Engineering and with Faculties across UofT. We established a number of new centres and institutes such as the University of Toronto Transportation Research Institute, Toronto Institute of Advanced Manufacturing, and Institute for Sustainable Energy bringing our total to 25. Engineering faculty also lead two major research initiatives, the Translational Biology and Engineering Program (TBEP), a key component of the Ted Rogers Centre for Heart Research, and Medicine by Design (MbD), that partner several UofT Faculties with our affiliated hospitals.

Strong resources in areas such as personnel, space, budget, and infrastructure have been critical enablers of our ability to achieve our Academic Plan goals. We have increased revenues and empowered our departments and institutes, through the implementation of our Faculty budget allocation model, to make strategic financial decisions while advancing academic priorities. We also invested heavily in initiatives that will further our goals through the Dean's Strategic Fund, Engineering Instructional Innovation Fund, and Dean's Infrastructure Improvement Fund. Since the launch of Boundless: The Campaign for the University of Toronto in 2011, we have raised over \$180 million of our \$200 million goal, including \$29.3 million in 2015–2016.

While we have made important investments in infrastructure improvements, the most significant has been towards building the Centre for Engineering Innovation & Entrepreneurship (CEIE). The CEIE will further enrich student experiential learning and heighten opportunities for cross-disciplinary research, and will launch the beginning of a new era in U of T Engineering. This, along with over \$48 million in investments through both the federal government's Post-Secondary Institutions Strategic Investment Fund (SIF) and the Dean's Infrastructure Improvement Fund (DIIF) to improve over 90 laboratory and high impact facilities, will enable us to bring our facilities in line with our reputation as the premier engineering school in Canada.

## 2. Culture of Excellence

Our culture of excellence is integral to all that we do as a Faculty and all that we plan to achieve. We have established ambitious goals in key areas of research, education, outreach and collaboration, as well as resource management. When strengthened together, these components have had an exponential impact on our standing as a leader among the world's very best engineering schools in our discovery, creation and transfer of knowledge and technology through teaching and research.

U of T Engineering is continually ranked as the top Canadian engineering school in all international rankings. This is but one measure we use to demonstrate our excellence. We recently published our eighth *Annual Report of Performance Indicators*, which provides a comprehensive analysis of our tremendous progress over the past decade, and also demonstrates how we are meeting the ambitious goals of this Academic Plan. We use these indicators and metrics as tools in our data-driven decision-making process to not only assess our progress, but also set measurable goals and adjust our actions as required.

Diversity plays a critical role in driving innovation, which is at the heart of engineering. It enhances the student experience and enriches the engineering profession with different perspectives and ideas. Our Faculty has made progress in increasing cultural and gender diversity in both our faculty and student complement. We have exceeded our goal of 25 per cent international students, with an undergraduate total of 27.9 per cent and 33.6 per cent graduate students, respectively. Through proactive recruitment efforts, we have also increased the number of female students and faculty. For the past three years, women have comprised more than 30 per cent of our first-year cohort, reaching an historic 40.1 per cent in 2016, up from 23.2 per cent in 2011. Women now make up 30.0 per cent of all undergraduate students, up from 23.8 per cent five years ago and 21.2 per cent in 2007. We have made more modest gains among our graduate population, with women making up 26.1 per cent of master's and PhD students, up from 24.9 per cent ten years ago. However, we expect that proportion to increase over the next few years as our current undergraduate classes complete their degrees and consider pursuing graduate studies.

Over the past 10 years, our Faculty has increased our women professoriate from 9.5 per cent to 21.0 per cent. This has been accomplished through strategic second-hire faculty lines and broad multidisciplinary searches. In 2013–2014, and again in 2015–2016, we conducted Faculty-wide, multidisciplinary academic searches targeted at interdisciplinary, diversity, research and teaching excellence. Through these searches, we hired seven outstanding women faculty with budgetary cross-appointments in two academic units. Since the beginning of this Academic Plan in 2011, U of T Engineering has hired 18 women

faculty. While we have made much progress, there is still more work to do to make our Faculty a reflection of the community in which we live.

Our faculty continue to distinguish themselves among our peers, consistently receiving more than 20 per cent of the major national and international honours and awards given to Canadian engineering professors, despite accounting for only 5.5 per cent of the nation's engineering faculty. These awards range from early-career to lifetime achievement, and recognize excellence in research and education, as well as contributions to the profession.

Over the past five years, all eight of our departments, institutes and divisions have undergone external reviews as part of the University's quality assurance process. Reviewers all spoke highly of the calibre of our programs and students, as well as the excellence and dedication of our faculty and staff. As part of our commitment to continuous improvement, academic unit heads annually report at Chairs and Directors meetings on progress towards addressing recommendations made in their external review reports. We have taken this process one step further and commissioned internal reviews of programs such as the Institute for Leadership Education in Engineering (ILead), Engineering Communication Program (ECP), Lassonde Mineral Engineering Program (LMEP), and Cross-Disciplinary Programs Office (CDP). These reviews enable us to examine existing programs, set goals for the future and create succession plans.

Over the course of this Academic Plan, we have established a number of task forces and working groups to review and make recommendations on key areas of importance. These include core first-year curriculum, academic and student advising, mental health strategies, makerspaces, and the creation of an Institute for Engineering Education. With the exception of the creation of an Institute for Engineering Education and makerspace review, which are still in progress, we have either implemented or are in the process of implementing recommendations from each report that will have a measurable impact on the student experience.

Professional development support for faculty and staff is another area that our Faculty continues to make progress on. We developed several workshops and luncheon panel series to assist early-career faculty in preparing funding applications, as well as peer review processes within the departments. We also created communities of practice for our student services staff, business officers and communications personnel. In addition to establishing groups from which to draw expertise, each community also sources experts to present workshops in key area of professional development.

Our Skule™ alumni are our ambassadors to the world. We cultivate opportunities for their involvement and rely on their expertise and perspective to strengthen our global reputation and inspire the next generation of engineering innovators and leaders. We

established Engineering Alumni Association chapters in Calgary, the Silicon Valley and Hong Kong, and host professional development, networking and recruitment events around the world. Alumni continue to volunteer as mentors in The Entrepreneurship Hatchery and on advisory and industry boards. Their engagement ensures that we bring the very best of Skule™ to all that we do.

## **CULTURE OF EXCELLENCE: ACADEMIC PLAN PROGRESS HIGHLIGHTS**

### **2.1 Maintain a strong Faculty vision for excellence in engineering education and research.**

- Consistently recognized as the premier Canadian engineering institution and one of the best in the world in all international rankings.
- Received an average of 26% of major national and international awards won by engineering professors in this country from 2011-2015.
- Earned 19 major education awards at university, national and international levels since 2010.
- Advocated the creation of new space on the St. George campus with the design and construction of the Centre for Engineering Innovation & Entrepreneurship (CEIE) to provide a home for multidisciplinary research institutes, prototyping and fabrication facilities as well as a dedicated space for student clubs and teams; the CEIE will set a new standard for engineering education and research.

### **2.2 Measure our progress in achieving our mission and vision.**

- Continuously assessed our progress through the development and publication of our *Annual Report of Performance Indicators*, the eighth edition of which was published in September 2016.
- Annually reviewed our actions and progress towards achieving our Academic Plan goals; shared through Faculty Council presentations, faculty and staff newsletter and website.

### **2.3 Increase diversity, focusing on gender diversity among students and faculty.**

- Progressively increased the percentage of women professors to 21.0% (2016–2017) up from 15.5 % (2011–2012) and 9.5% in 2005–2006; adding 29 women professors to our ranks in the past decade.
- Hired seven outstanding women professors through Faculty-wide, multidisciplinary searches, with budgetary cross-appointments in two academic units.
- Increased gender diversity among undergraduate students: women made up 40.1% of entering first-year engineering students in fall 2016, the third year in a row that women have comprised more than 30% of our entering class; up from 23.2% in fall 2011.
- Made moderate gains in increasing the number of female graduate students to 26.1% compared to 24.9% in 2011.

- Increased the proportion of international graduate students to 31.6% in 2016, up from 19.3% in 2011.
- Surpassed revised goal of 27% international undergraduate students (original goal 25 %) with 27.9% in 2016, up from 19.1% at the start of the Academic Plan and 9.8% in 2006.
- Continued to offer robust outreach initiatives to support strategic recruitment; for example, 91% of the 87 female high school students who attended the 2016 Girls' Leadership in Engineering Experience (GLEE), an event for female high school students with offers of admission to the Faculty, subsequently accepted our offers, (up from 77% in 2013).

#### **2.4 Support the development of faculty members as outstanding engineering educators and researchers.**

- Won a remarkable number of major emerging leader/early career awards, including the Ontario Professional Engineers Awards Young Engineer Award and the E.W.R. Steacie Memorial Fellowship.
- Enhanced the nomination process for discipline-specific awards at the departmental/institute level by establishing awards committees in each unit.
- Hosted the biannual Educational Technology Workshop "EdTech" to help instructors share best practices for innovative teaching and learning.
- Created the Percy Edward Hart and Erwin Edward Hart Professorships from proceeds of a \$20-million endowment from the Hart Trust: awarded seven faculty members, each within the first 10 years of his/her academic career, \$75,000 per year for three years for research and graduate student support.
- Established a departmental peer review process and Faculty-wide workshop lunch series to support and guide faculty members in the development of their NSERC Discovery Grant, Discovery Accelerator Supplements and Research Tools and Instruments grant applications.
- Implemented workshops and panel sessions around all major grant programs, featuring experts who served on review committees and/or had great success in the program in the past.

#### **2.5 Support our students by strategic efforts to build upon educational, extracurricular and co-curricular experiences.**

- Launched our interdisciplinary graduate collaborative program (MAsc and PhD) in Engineering Education in partnership with Ontario Institute for Studies in Education (OISE) in 2014; currently has 12 graduate students.
- Reached a record 790 engineering students participating in the Professional Experience Year in 2015–2016, up from 581 in 2011–2012 and 447 in 2006-07.
- Continued to increase minor enrolment and completion rates, with 32% of graduating students completing a minor in 2015–2016, up from 19% in 2011–2012.
- Grew the number of students graduating with an Engineering Business minor or certificate to 34% (356 students) since its launch five years ago.



- Created the Entrepreneurship Hatchery in 2011 to nurture and launch a culture of entrepreneurship within the Faculty of Engineering and the University; since inception have accepted 423 students and 219 teams in the summer cohort.

## **2.6 Maximize the skills of our staff members and create opportunities to strengthen their performance and develop them as integral contributors to the Faculty's mission.**

- Continued to recognize the successes and contributions of staff through five Faculty awards since 2009.
- Encouraged secondments throughout the Faculty, as appropriate, to enable staff to develop new skills.
- Contributed to staff skill development for business administrative staff and student support staff through networking groups and presentations from University experts on relevant issues, policies and procedures.
- Established a Human Resources office in 2013, and engaged in discussions with business officers and Chairs and Directors to assess needs and priorities in this area.
- Secured funding and related support from the Office of Student Life for a professional development day for all registrarial staff at U of T; held in November 2012 with more than 300 staff attending from the three campuses.
- Established a series of workshops through the Organizational Development and Learning Centre (ODLC) for staff advisers and student life professionals in 2012–2013; ODLC now has a number of courses to assist staff working closely with students.
- Offered staff sessions on the services/mental health support provided by the Employee and Family Assistance Program and offered a mental health session to chairs and directors to assist in supporting staff and faculty.
- Continued to foster the skills of staff members and faculty through the Engineering Engagement & Development Network. This cross-Faculty group helps staff and faculty engage in and become more aware of activities and events happening across the Faculty and also provides professional development workshops, webinars and discussion forums.

## **2.7 Increase staff retention and enhance succession planning within the Faculty.**

- Fostered collaboration and communication between Human Resources, the Business Administration group and the Engagement & Development Network to share information and best practices.
- Established a working group of business officers and human resources staff who meet regularly to share information and best practices.
- Increased HR service delivery and resources for staff.

## **2.8 Build upon alumni involvement with the Faculty to share their world-based expertise and perspectives, to strengthen our reputation and to inspire the next generation of U of T engineers towards innovation and excellence.**

- Strengthened ties with our alumni throughout the world by establishing Engineering Alumni Association chapters in Calgary, Silicon Valley and Hong Kong.

- Hosted alumni events in North America (San Francisco, Palo Alto, Calgary and Vancouver), Turkey and Asia-Pacific (Hong Kong, Korea, Singapore and Taiwan).
- Held 84 alumni networking and professional development events in 2015–2016, up from 61 in 2013–2014.
- Increased awareness of the positive impact alumni volunteerism has on current students and faculty by launching a communications campaign to promote volunteer opportunities and highlight the benefits of giving back to U of T Engineering.
- Grew our Alumni Mentorship Program in 2015–2016, with 161 mentors and 280 mentees taking part — increases of 33% and 16% respectively over the previous year.
- Expanded engagement with current students — our future alumni — by creating a new Alumni Outreach Director position on the Engineering Society, initiating the inaugural Engineering Society Heritage Awards Celebration of current and past officers of the Engineering Society, and increasing participation in Gratitude, which encourages graduating students to give back for future students.

## **2.9 Enhance governance processes, cyclical reviews and quality assurance processes.**

- Received accreditation through the Canadian Engineering Accreditation Board of all nine engineering programs; next review scheduled for the 2018–2019 academic year.
- Conducted external reviews of all eight of our academic units over the course of the past five years; overall reviewers spoke highly of the calibre of our programs and students, as well as the excellence and dedication of our faculty and staff.
- Conducted several internal reviews at either the Decanal or departmental level for units and programs such as: the Institute for Leadership Education in Engineering (ILead); Lassonde Mineral Engineering Program (LMEP); Cross-Disciplinary Programs (CDP); and the Engineering Communication Program (ECP).
- Reviewed the Faculty Constitution and ensured alignment with University terms of reference and policies, and with editorial updates to modernize and standardize the language.
- Strengthened Faculty governance and external review processes through the development of guidelines, templates and standardized communications (e.g., itineraries, timelines, report outlines).
- Delivered governance orientation sessions to relevant stakeholders.
- Shared annual progress reports on department and institute external review recommendations at regularly scheduled Chairs and Directors meetings.

## **2.10 Strengthen communications both internally and externally.**

- Continued to inform key stakeholders about the Faculty’s activities and progress through regular newsletters to students, faculty and staff, and alumni; recently redesigned templates to better engage with readers through a more user friendly format.
- Redesigned quarterly alumni e-newsletter, beginning with the fall 2015 issue, which resulted in a 37.3% open rate, 15 percentage points higher than the industry benchmark. This led to an additional 1,100 alumni readers per issue.
- Created an online resource for staff and faculty to address e-mail volume concerns raised by students to better communicate with engineering students: [uoft.me/engcomms](http://uoft.me/engcomms). This resource — which includes a diagnostic tool, best practices, a sample communication plan

and a variety of downloads — was developed in consultation with students, staff and faculty within U of T Engineering.

- Increased collaboration, knowledge-sharing and skills-building for the Faculty communicators who make up the Engineering Communications Network (ECN) through more frequent gatherings, professional development and ongoing use of the ECN online community.
- Continued to disseminate exceptional stories on the achievements of the students, faculty, staff, alumni and industry partners who form our vibrant community via integrated internal and external communications strategies, including enhanced brand journalism, customized pitching and expanded social media reach.
- Refreshed and relaunched Faculty website with a clean look and feel to improve user experience, mobile accessibility and site performance, and continue to unify the Engineering web experience by applying standardized templates, consistent visual branding and improved navigation across all sites.

### **2.11 Continue to acknowledge the accomplishments of our students, faculty and administrative staff.**

- Recognized the excellence of our staff and faculty through a number of awards for research, teaching, leadership and dedication to improving the student experience; these awards are presented at the annual Celebrating Engineering Excellence event, held each spring.
- Increased coverage of student and faculty accomplishments through the U of T Engineering News, *The Engineering Newsletter* and the Faculty's websites.
- Ensured senior administrative staff were nominated for and participated in the University's New Manager Academy and Business Manager Leadership Program.

### 3. Positioning

The final year of our Faculty's Academic Plan was characterized by exceptional opportunities to enhance our standing as Canada's premier engineering program and one of the world's best with key regional, national and international audiences. Our global leadership in multidisciplinary research, pioneering experiential education and world-leading entrepreneurship and commercialization once again earned us recognition as the top-ranked engineering school in Canada across all international rankings.

The Centre for Engineering Innovation & Entrepreneurship (CEIE), the Faculty's newest building, embodies our commitment to research excellence and teaching. The CEIE, which is currently under construction, provides a tremendous opportunity to introduce stakeholders to this next era in the history of U of T Engineering. To do this, we conceived, designed and unveiled Toronto's longest single graffiti installation on the construction hoarding surrounding the site. This project allowed us to leverage our urban location, start a public conversation about the positive impact of engineering on society, and celebrate the history and achievements of U of T Engineering.

The Faculty garnered more than a 15 prestigious communications awards over the past five years, and was named the Not-for-Profit Communication Department of the Year at the world conference of the International Association of Business Communicators (IABC). The CEIExSKAM graffiti mural project earned a Gold Quill Award of Excellence and an Ovation Award from the IABC, a Prix d'Excellence from the Canadian Council for the Advancement of Education, and several other prizes, and our flagship publication, the Annual Report of Performance Indicators, was recognized with an IABC Gold Quill Award of Excellence.

Our integrated internal and external communications strategies, including enhanced brand journalism, custom pitching and expanded social media reach, disseminated stories on the achievements of the students, faculty, staff, alumni and industry partners who form our vibrant community. From 2011–2016 we published more than 1,100 stories on the U of T Engineering News website. This year alone, we secured more than 3,400 media stories in strategic priority areas, nearly 60 per cent of which appeared in international outlets.

We leveraged existing communications channels in new ways, debuting fresh approaches to our digital platforms. We refreshed and relaunched our Faculty homepage with a clean look and feel to improve usability, mobile accessibility and loading times. In addition, our renewed focus on social media has led to growing engagement across all channels, strengthening relationships with our vibrant community, particularly students and alumni.

The past five years have seen unprecedented change in the communications and media landscape. Our success in telling the U of T Engineering story to different audiences across multiple platforms will position us for success over the next five years as we continue to build our Faculty's brand as a global leader in multidisciplinary research and education, and as a powerful engine driving the new innovation economy.

## **POSITIONING: ACADEMIC PLAN PROGRESS HIGHLIGHTS**

### **3.1 Deliver a plan that articulates our communication goals, maintains consistency of our branding and products, keeps on top of markets, and clearly outlines methods so that we can remain competitive and set the Faculty apart.**

- Completed original plan in early 2013; identified strategic communications foci for external media in 2014–2015 and further refined editorial priorities in alignment with both Faculty's Academic Plan and President's Three Priorities.
- Strengthened focus on existing four themes that underpin the Faculty's internal and external news and media relations efforts:
  - world-class research;
  - entrepreneurship and innovation;
  - student experience; and
  - enriching engineering education.
- Placed additional emphasis on stories that demonstrate the Faculty's global leadership in the following three areas:
  - international impact;
  - innovations in engineering experiential learning; and
  - multidisciplinary collaboration in both research and teaching.

### **3.2 Strengthen the Faculty's key messages and customize them for target audiences.**

- Assessed metrics in key areas to express the core messaging of the Faculty of Applied Science & Engineering in our eighth *Annual Report of Performance Indicators*, published in September 2016.
- Earned a Gold Quill Award of Excellence from the International Association of Business Communicators (IABC) for the 2015 edition of the *Annual Report of Performance Indicators*.
- Conceived, designed and unveiled Toronto's longest single graffiti installation on the construction hoarding surrounding the Centre for Engineering Innovation & Entrepreneurship (CEIE). Building on momentum from the groundbreaking ceremony in June 2015, this project allowed us to leverage our urban location to start a public conversation about the positive impact of engineering on society, as well as celebrate the history and achievements of U of T Engineering.

- Refreshed our Faculty’s website with an increased emphasis on streamlining design, refining content and promoting news. The new homepage features a cleaner layout and more sophisticated design, prominent visibility for the latest Faculty news, quick access to key facts and info, and improved display on mobile devices and faster loading times.
- Implemented new practice of refreshing Faculty homepage daily to promote the latest news stories and demonstrate relevance within the broader national and international context, such as the 2016 Olympics in Rio de Janeiro and the back-to-school period.
- Conducted focus groups in November 2015 with engineering undergraduate students across all years to better understand how they consume e-communications received from staff and faculty. Feedback indicated that high e-mail volume, combined with messages that are dense or difficult to read, leaves this key audience feeling frustrated. To address this challenge, the Faculty developed an online tool that will help faculty and staff improve the quality of e-communications, while decreasing volume.
- Developed a visually engaging one-page infographic to consolidate Faculty key messages. This reputation-building piece provides a single solution to align messaging across the Faculty’s many external points of contact, such as our Recruitment, Outreach and Advancement teams, as well as all members of the Engineering Communications Network (ECN) representing the Faculty’s departments, divisions and institutes. The concise format serves our diverse key audiences, including prospective students, alumni and industry partners.
- Launched Faculty-wide initiative to develop new templates for advancement materials, designed to be customizable to serve departmental, divisional and institutional priorities with consistent visual identity. Debuted completed folder and custom inserts for IBBME, followed closely by Civil Engineering, with all other groups to follow.
- Designed brochure for The Entrepreneurship Hatchery, capitalizing on the University of Toronto’s status as the number one university in North America for research-based startups and featuring a strong call to action for advancement prospects. Further tailored this material for a prospective student audience, enhancing the profile of CEIE facilities that will enable aspiring entrepreneurs to accelerate their innovations from concept to commercialization. This version of the brochure reached thousands of prospective students at the 2016 Ontario Universities Fair, the single largest event of the recruitment cycle.
- Continued to take an active role in University-wide brand equity consultations led by University of Toronto Communications (UTC), representing the Faculty’s brand identity and vision.

### **3.3 Establish the Faculty as the go-to resource for media looking for comments and engineering expertise on breaking news issues.**

- Continued to build the Faculty’s reputation as the premier engineering school in Canada and among the world’s best with key local, national and international audiences by securing more than 3,400 media stories, in 2015-2016 alone, in strategic priority areas. Nearly 60 per cent of these stories appeared in international outlets.
- Refined and enhanced the Engineering presence in the University of Toronto Blue Book, a resource for journalists seeking comment on breaking news issues and current affairs.
- Increased proactive pitching of U of T Engineering experts on breaking stories of global significance.
- Increased share in local, national and international media outlets to build awareness of U of T Engineering’s position as the top-ranked engineering school in Canada, particularly along five strategic focus areas.

### **3.4 Continue to increase the quality of our storytelling, journalism and communications processes and tools to make our practices best-in-class and in pace with emerging technologies and their uses by our target audiences.**

- Garnered more than 15 prestigious communications awards, including being named the Not-for-Profit Communication Department of the Year at the world conference of the IABC.
- Launched innovative, multi-platform media campaign to support CEIExSKAM graffiti mural, which 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 IABC.
- Published more than 1,100 stories on U of T Engineering News.
- Secured more than 28,000 media stories mentioning the University of Toronto with the key word 'Engineering' since launching our targeted media monitoring services in 2014.
- Generated more than 10.7 billion impressions with this earned external media presence — a measure of the total number of potential readers, viewers and listeners who interacted with our content — and over \$56 million in equivalent advertising value, the cost of purchasing equivalent ad space or air time with the news outlets in which our stories appeared.
- Refreshed editorial approach to news coverage by incorporating social-first treatments of select student-focused and awards stories.
- Undertook communications workflow audit in fall 2015, which led to closer coordination among more than 30 communicators who comprise the Engineering Communications Network (ECN).
- Consolidated comprehensive list of academic and research priorities for all departments, division and institutes to raise awareness, encourage sharing of best practices, and further streamline coordination and collaboration between the ECN and Engineering Strategic Communications team.

### **3.5 Remain flexible to changing media and technologies, nurture blogger and social media relationships, and build relationships and communications with traditional media.**

- Capitalized on reality of shrinking newsrooms by producing award-winning, high-quality content and supporting multimedia assets for journalists, delivered via highly targeted tailored pitches. This approach resulted in many top international outlets, including The Daily Mail, Forbes, VICE Motherboard, Science Daily, and more, picking up U of T Engineering stories and materials.
- Delivered a combination of brand journalism, proactive pitching and extending content reach via social media resulting in strong local, national and international coverage.
- Fostered ongoing relationships with local journalists to secure far-reaching coverage for several experiential learning and student life stories that strengthen the Faculty's image as a place that nurtures the next generation of global engineering leaders.

### **3.6 Increase the Faculty's presence, visibility and reputation on modern social media platforms.**

- Expanded the reach of the Faculty's social media channels: Facebook engagements grew 447% and Twitter engagements grew by nearly 600% over the previous year.

- Relunched our Instagram channel in January 2016 with a new focus on engineering student life and our diverse engineering community. Since this relaunch we have seen a surge of engagement on Instagram, and have increased our number of followers by roughly 250% to more than 1,440 as of September 2016.
- Established performance indicators and added regular tracking of social media metrics to monthly media relations reports, allowing us to set a baseline for evaluating the effectiveness of our social media strategy.
- Executed a social media campaign to coincide with international Pride Month in June 2016 and #DisplayYourPride day across all three University of Toronto campuses. This short video showed students, faculty members, staff and Dean Amon working together to build a rainbow flag made of three-foot balloons to celebrate our vibrant and diverse U of T Engineering community. The project gained massive traction across our social media platforms, including Facebook, Twitter, Instagram and YouTube, garnering more than 100,000 post impressions on Facebook alone and more than 4,000 views of the video.



## 4. Educating Future Engineers and Student Experience

U of T Engineering has built a global reputation for excellence that attracts the brightest students from around the world to our undergraduate and graduate education and research programs. Our curriculum, experiential learning opportunities, and co-curricular programs show our commitment to develop the next generation of makers, innovators and engineering leaders with global fluency. We have achieved, and in some cases surpassed, our Academic Plan quantitative goals in engineering education and student experience, and continue to evaluate new opportunities that will further these aims.

The number of applications to our undergraduate programs has grown by 65 per cent in the past five years (7.2 per cent in the past year alone), with applications from international students more than doubling in that period. We received more than 12,000 applications for the 2016–2017 academic year — effectively 12 applications for each available spot. Admission to our undergraduate programs have become increasingly competitive. To further assist us in our selection process, we implemented a broad-based admissions system three years ago that uses videos and timed written responses to provide a more comprehensive picture of each applicant and help determine critical success factors. This incoming cohort is among our most diverse and accomplished yet. The Ontario Secondary School average is 93.4 per cent, up from 90.4 per cent in 2011 and 85.5 per cent in 2006. Our strategic recruitment efforts in established and emerging markets are bearing fruit. Events such as Girls' Leadership in Engineering Experience (GLEE), Young Women in Engineering Symposium (YWIES), high school visits by Women in Science & Engineering (WISE) and Engineering Society students, as well as our pre-university outreach activities also help us recruit outstanding young women to our undergraduate programs by providing opportunities to interact with current students, faculty and alumni. As mentioned in our Culture of Excellence chapter, women have comprised more than 30 per cent of our first-year classes for the past three years, with a huge leap to 40.1 per cent this year. International students comprise 27.0 per cent of the first-year cohort, up from 24.2 per cent in 2011 and 13.3 per cent in 2006. Overall, women now make up 30.0 per cent of our undergraduate class while international students are at 27.9 per cent. Our retention rate between first and second year rose to 96.8 per cent in 2015–2016 from 83.1 per cent in 2006–2007. This increase can be attributed both to the quality of students and the support programs we have established to assist students in their transition from high school to university.

Enrolment in our graduate programs has also progressively risen to 2,364 in 2016, surpassing our goal of 2,000 by 2015. We accomplished this three years early, in part because of rising enrolment in our MEng programs, particularly among international

students. Enrolment in our professional master's programs has grown by 427 per cent in the past ten years and now comprises 54 per cent of all master's students (goal was 50 per cent by 2015). Our participation in the Canadian Graduate Engineering Consortium, along with the University of Alberta, University of British Columbia, McGill University and the University of Waterloo, has also enabled us to recruit top domestic graduate students.

We live in an increasingly complex world where engineers make a tremendous impact in solving pressing global challenges. To ensure our students are prepared to contribute to this endeavour, our Faculty has strengthened our curricular, co-curricular and experiential learning opportunities in key areas of design, teamwork, communication, leadership, and entrepreneurial competencies. We established a task force to review the core first-year undergraduate curriculum, and have implemented several of its recommendations over the past two years. These include the development of a new course, APS100 - Orientation to Engineering, that has been specifically designed to assist students with the transition from high school to university and consists of lectures on key topics and tutorials led by upper-year teaching assistants. We have capitalized on the use of technology to create new modalities to engage students in the classroom. We record lectures for all Core 8 first-year courses, offer four first-year courses fully online, two inverted classroom models where students review lectures online ahead of class and use in class time for discussion and interaction, and a Technology Enhanced Active Learning (TEAL) classroom that has been used for various courses and tutorials. MEng students now have the opportunity to participate in distance learning through four online courses, with another in development. We have made progress on incorporating design across the curriculum. All first-year students participate in either Engineering Strategies and Practice or Praxis and culminate with their fourth-year capstone course. The Multidisciplinary Capstone Project course (APS490) provides students with an opportunity to work with their peers in other disciplines on projects proposed by our industry partners. A total of 240 students in 56 teams have participated since the course's inception in 2012, and feedback has been very positive. We expanded this industry project-based learning to MEng students in 2015-2016.

Demand for curricular and co-curricular offerings through the Institute for Leadership Education in Engineering (ILead) continues to grow at both the undergraduate and graduate levels. We offer five undergraduate and five graduate courses in areas ranging from leadership in project management to positive psychology for engineers. These courses can be counted towards the Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) certificate for graduate students or the Engineering Business minor or Engineering Leadership certificate for undergraduates. We also offer co-curricular programs and competitions such as Leadership Labs, The Game, and the ILead Summer Fellowship and Leadership programs.

A major focus of our Faculty has been to expand multidisciplinary education, including undergraduate minors and graduate emphases. We now offer 15 undergraduate minors and certificates, and 12 graduate emphases.

Our Cross-Disciplinary Programs Office continues to develop innovative undergraduate programming both across the Faculty and in partnership with other U of T Faculties. Our students' enthusiasm for the breadth, depth and formal recognition of these offerings is evidenced by the fact that more than 50 per cent of our 2015-2016 undergraduate graduating class completed either a minor or certificate. Our cross-Faculty initiative with the Rotman School of Management has continued to surpass expectations; this past year, 32 per cent of students graduated with either a minor or a certificate in Engineering Business. In 2015, we also 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, twice the number of the first cohort in 2015.

We have created a diverse range of emerging, multidisciplinary areas emphases that have become key recruiting tools for MEng students. Since the creation of the first graduate certificate, ELITE, in 2007, we have developed 11 additional certificates/emphases ranging from Global Engineering to Advanced Water Technologies to Advanced Manufacturing, which launched in 2015. In 2014, we launched an interdisciplinary collaborative graduate program in Engineering Education with the Ontario Institute for Studies in Education (OISE). The synergies created between Engineering and OISE students, as they shape tomorrow's engineering education, will impact our teaching practices and students' learning. In 2016, the first cohort of students enrolled in the MEng in Biomedical Engineering began their studies. This one-year program focuses on the design and commercialization of biomedical devices and was developed for students planning to move directly into industry.

Our two in-house incubators, The Entrepreneurship Hatchery and Start@UTIAS, provide mentoring, networking, seed funding and other resources to undergraduate and graduate students who are interested in developing businesses. The Hatchery has launched 37 start-ups since 2013, and had an increasing number of students and teams apply to its summer program. Throughout the year, it offers speakers series, idea markets and hackathons designed to engage students in the entrepreneurial process. The Hatchery is now moving into the second phase of its evolution by supporting graduate students and researchers with their commercialization plans. Start@UTIAS provides graduate students from UTIAS with similar tools and resources. Seven teams were part of the 2015–2016 cohort after successfully completing two grant processes and pitching their ideas.

Opportunities to enhance technical competencies while gaining valuable work experience resonate strongly with our students and has resulted in a record 790 students participating in our Professional Experience Year (PEY) program, up from 581 in 2011–2012. With more than 70 per cent of PEY students returning from their internships with confirmed or tentative job offers when they graduate, the program is very attractive to our undergraduates. Still, we recognize that we can do more to help our students develop professional competencies. With this in mind, we have appointed an academic director who will work with the executive director of the Engineering Career Centre to better integrate with other areas of the Faculty to provide professional development workshops and skill building sessions. Our goal is to improve the student experience by taking advantage of the expertise that exists throughout the Faculty and working collaboratively with other units.

The Centre for Engineering Innovation & Entrepreneurship (CEIE) embodies these efforts to enhanced multidisciplinary collaboration and innovation. Designed to further enrich student experiential learning and heighten opportunities for cross-disciplinary research, the CEIE will launch the beginning of a new era in U of T Engineering.

#### **4.1 EDUCATING FUTURE ENGINEERS: ACADEMIC PLAN PROGRESS HIGHLIGHTS**

**4.1.1 Maintain and strengthen our high-quality education through continued review and assessment of our programs and curricula for currency, vision and relevance. Establish desired learning outcomes for graduate and undergraduate students to ensure they are well prepared as future engineers. Evolve our cyclic reviews and plan for continuous quality assessment within the new UTQAP and CEAB Graduate Attribute systems.**

- Completed the Canadian Engineering Assessment Board (CEAB) accreditation review: all nine programs received maximum accreditation to 2019.
- Received the final report of the Dean’s Task Force for Core First Year Curriculum Review in December 2014 and began implementation of recommendations to integrate our first-year courses, support high-quality teaching and learning, and improve the transition to first year and overall student experience.
- Launched a new first-year course APS100 - Orientation to Engineering, which consists of lectures as well as tutorials led by upper-year undergraduate teaching assistants to help students transition into the engineering academic environment.
- Initiated a review of the content and delivery of Engineering Strategies & Practice (ESP) I and II to better integrate ESP with other first-year courses and departmental curricula, improve assessments within the course, ensure a reasonable course workload, and improve awareness of the purpose and outcomes of these courses within the departments and Faculty.
- Integrated the work of the Graduate Attributes Committee into the Undergraduate Curriculum Committee; collected data through various initiatives for analysis and initiated a curriculum mapping process to align with CEAB requirements.

**4.1.2 Further integrate professional competencies, such as global engineering, entrepreneurship, leadership and communication into undergraduate and graduate curricula. Define, assess and measure our programs and curricula successes through the UTQAP UDLEs, GDLEs and cyclic reviews and through the CEAB Graduate Attributes.**

- Supported by multi-year start-up funding via the Dean's Strategic Fund, launched initiatives to integrate professional competencies in the areas of global engineering, entrepreneurship, leadership and communication through the Institute for Leadership Education in Engineering (ILead), the Institute for Robotics and Mechatronics (IRM), the Institute for Sustainable Energy (ISE), and the Centre for Global Engineering (CGEN).
- Established undergraduate minors and/or certificates in Engineering Business, Engineering Leadership, and Communication.
- Developed 11 additional graduate certificates/emphases since the creation of the first graduate certificate in Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE) in 2007, ranging from Global Engineering to Advanced Water Technologies.
- Created a common database for generating the required curriculum maps for the CEAB review and developed the documentation processes to monitor curriculum changes; reviewed the terms of reference of the Undergraduate Curriculum Committee to ensure this will occur in a systematic and organic approach.

**4.1.3 Enrich the quality of undergraduate academic experience by increasing flexibility in the undergraduate curriculum, continuing to develop progressive opportunities for students to pursue their professional interests, and integrating professional competencies throughout the curriculum.**

- Increased the number of engineering students participating in the Professional Experience Year (PEY) internships to 790 in 2015–2016 with 79 international placements, from 581 in 2011–2012 and 34 international placements.
- Experienced tremendous growth in minor and certificate program enrolments, with 55 per cent of the 2016 graduating class completing either a minor or a certificate.
- Grew the percentage of undergraduates graduating with either a minor or a certificate in Engineering Business from 2% in 2011-2012 to 34% in 2015–2016.
- Expanded the number of undergraduate minors and certificates offered to 15:
  - Minors include: bioengineering; biomedical; engineering business; environmental engineering; nanoengineering; robotics and mechatronics; and sustainable energy.
  - Certificates include: Communication; Engineering Business; Engineering Leadership; Entrepreneurship; Global Engineering; Mineral Resources; Nuclear Engineering; and Renewable Resources Engineering.
- Developed the multidisciplinary capstone design course (MCP) offered by the University of Toronto Institute for Multidisciplinary Design & Innovation; 240 students participated from across all undergraduate programs since its inception in 2012.
- Introduced a new Engineering Science major in Robotics Engineering. 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.

#### **4.1.4 Continue to support and enhance undergraduate students' opportunities for self-directed learning and study time, and participation in the enriching extracurricular activities within our Faculty, across the University, and beyond.**

- Created two massive online courses, with the second one on the Coursera platform, in Wind, Waves and Tides: Alternate Energy Systems, drawing more than 11,000 people. Also created a series of courses for Coursera on iOS App Development that can be taken to earn a specialization.
- Expanded the number of first-year online courses to four, allowing students more choice in how they access education material: APS160 - Mechanics, APS162 and APS163 - Calculus for Engineers I and II, and APS164 - Introductory Chemistry from a Materials Perspective.
- Continued to video capture lectures for most first-year classes to provide more flexibility to students and enable them to review lectures outside of class.
- Used the inverted classroom model, in which students watch lectures online prior to class and use classroom time to engage in experimental learning, in classes such as ECE221 - Electricity and Magnetism and CIV235 - Civil Engineering Graphics.
- Developed four online courses for our ELITE program, each offered annually with our most popular one offered every semester.
- Supported over 100 of student clubs and initiatives annually through the Centralized Student Club Funding Process.

#### **4.1.5 Enhance our instructional space to facilitate innovative teaching methods and create efficiencies on how we share space. This includes flexible interactive teaching space for substantial numbers of students, design and group project space and lecture/lab combination space.**

- Piloted a Technology Enhanced Active Learning (TEAL) classroom in 2014. Located in the Sandford Fleming building, this room offers an innovative environment that facilitates collaboration and experiential learning, enhanced by technology and strategic design.
- Began construction on the CEIE in June 2015, which will TEAL rooms, a 500-seat auditorium featuring small-group seating and highly interactive learning and communications technology, and prototyping and light fabrication facilities.
- Supported a joint project by UTIAS and MIE, through the Engineering Instructional Innovation Program, to create parallel classrooms to allow graduate students in each program to participate simultaneously in lectures delivered from either of two locations.
- Expanded the IBBME Teaching and Design Studio laboratories to facilitate the launch Collaboratory on Advanced Learning and Innovation in Bioengineering Education (CALIBRE) program.

**4.1.6 Provide reliable, accessible, effective computing services and study spaces within and outside computer laboratories, library and classrooms to enhance efficient interactive learning and socialization where today's student "lives."**

- Upgraded and extended wireless internet access in three buildings for complete building coverage, (Galbraith, Sandford Fleming and Bahen Centre).
- Added total of 234 study spaces to engineering buildings in the past five years to enhance interactive learning and socialization for students.
- Provided funding for five Dean's Strategic Fund proposals to improve design, club, and meeting spaces throughout the Faculty.
- Created additional student study spaces through renovation of the library.

**4.1.7 Link the quality of student learning, the quality of their education and their improved future performance with teaching effectiveness. Continue to inspire and support the Faculty's culture of teaching excellence and encourage Faculty members and teaching assistants to reflect upon their teaching effectiveness through enhanced feedback mechanisms. Support teaching initiatives and opportunities that will improve their professional development as educators.**

- Increased the percentage of teaching and research staff hold either P.Eng or LEL designation to 94%.
- Established two new faculty awards, the Sustained Excellence in Teaching Award and the Research Leader Award.
- Implemented a professionally validated course evaluation system that informs our academic leadership about how well instructors are meeting the teaching needs of our students and provides input on ways to improve.
- Co-lead planning for the biannual Educational Technology Workshop "EdTech" to help instructors share best practices for innovative teaching and learning.
- 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.
- Held annual First Year Instructors Day to help ensure consistency in student experience and raise awareness among our instructors of supports that are available to first-year students.
- Offered teaching assistant training twice each year to improve quality of tutorials.

#### **4.1.8 Continue to attract and retain diverse, outstanding students from a wide range of backgrounds in order to provide an exceptional education for future global engineers and leaders. In particular, we must strive to attract more female students into our programs.**

- Achieved our Academic Plan goal of attracting more female students to our programs:
  - Increased the proportion of women in our undergraduate student body to 30.0% in 2016, from 23.4% in 2011.
  - Women comprised a record high 40.1% of our first-year undergraduate class in 2016 compared to 23.2% in 2011, this is the third year in a row it has exceeded 30%.
- Continued to attract and retain diverse students: increased the proportion of incoming international undergraduate students to 27.9% in 2016, from 24.2% in 2011, and the proportion of international graduate students to 33.6% from 19.1% over the same period.
- Initiated the creation of annual Young Women in Engineering Symposium; now in its third year, which attracted more than 50 top female high school science students from across the Greater Toronto Area.
- Expanded the broad-based admissions process for candidates applying to our undergraduate programs in fall 2014 with videos and timed essays; this pilot project, the first of its kind among Canadian engineering schools, gives our admissions committee more comprehensive knowledge of each applicant.
- Created Girls' Leadership in Engineering Experience (GLEE), a weekend-long program for female students with offers of admission to U of T Engineering. The goal of the program is to inspire these students to learn more about the contributions they can make as engineers and the unique opportunities our Faculty offers. In May 2016, 91 per cent of the 87 students participating in the program accepted our offers of admission.

#### **4.1.9 Strategically award admission scholarships to meet our student recruitment goals.**

- Participated in the University-wide President's Scholars of Excellence Program, with unique elements added for engineering students since 2013.
- Introduced an entrance scholarship for international students, the U of T Engineering International Scholar Award covers the full cost of tuition (up to \$45,700) and is renewable for four years.

#### **4.1.10 Reduce the dwell time for MASc and PhD students and address time-to-graduation issues.**

- Held time to graduation to an average 5.3 years for PhD students, compared to 5.5 years for UofT overall, and 2.0 years for MASc students.
- Implemented measures within departments to track progress of PhD students, including software tracking system in ECE, which will also be available for use in other departments and institutes.
- Shared best practices among graduate associate chairs, adopting particularly successful practices.



#### **4.1.11 Continue to develop vibrant MEng programs and offer a larger variety of courses suitable to MEng students.**

- Expanded the ELITE program in 2015–2016 to include five new courses for a total of 37.
- Offered four fully online ELITE courses, with at least one course offered each term.
- Strengthened MEng offerings by launching program emphases in: Sustainable Energy, Advanced Manufacturing, Advanced Water Technologies & Process Design, Sustainable Aviation, and Financial Engineering. Total number of areas of emphasis is now 12.
- Launched Master of Engineering in Cities Engineering and Management (MEngCEM).
- Launched MEng in Biomedical Engineering to focus on medical device design.

#### **4.1.12 Increase graduate student enrolment to reach 2,000 graduate students by 2015, with particular focus on increasing PhD and MEng students and aiming to reach an average of one PhD graduated annually per faculty member. At the same time, we will endeavor to reduce our undergraduate student enrolment to 4,000 by 2015, with 25% of undergraduates consisting of international students. In fall 2010, Full-Time Equivalents (FTEs) were 4,599 undergraduate and 1,527 graduate students, a percentage ratio of 75.1% to 24.9%.**

- Surpassed Academic Plan goal of enrolling 2,000 graduate students by 2015 three years ahead of schedule, now at 2,364.
- Increased the proportion of graduate students in our overall student body 32.9%, bringing us closer to our longer term goal of 40%.
- Increased the total number of full-time equivalent professional master's students to surpass the number of full-time equivalent MASc students (56%, goal was 50%).
- Increased total number of students pursuing professional master's degrees (MEng and MHSc) to 882 in 2016–2017, more than triple the enrolment in these programs a decade ago.
- Increased the number of students in our PhD program by 58% over the past decade.
- Grew the number of full-time equivalent MEng students by 600% over the past decade through the development of vibrant programs, including specializations in Sustainable Energy, Robotics & Mechatronics, and Engineering & Globalization.

## **4.2 STUDENT EXPERIENCE: AP PROGRESS HIGHLIGHTS**

### **4.2.1 Ensure that all our undergraduate curricula provide students with sufficient self-directed time to fully reflect on and understand the material in their program, the vision and relevance to 'learn how to learn,' and the advantage of taking opportunities to experience and engage in University life outside the classroom through extracurricular and co-curricular activities.**

- Continue to offer programs such as Success 101, a three-day academic skills mini-course as part of the First Year Foundations Program, several times each summer to help new students prepare for their studies at U of T Engineering.

- Increased the undergraduate retention rate to a record 93.8% in 2014 from 80.9% a decade ago.
- Held town hall meetings dedicated to open discussion on Faculty program enhancements, offered panel discussion on exchange opportunities; efforts translated to a 68% increase in applications for international summer exchange programs.
- Launched 34 start-ups through The Entrepreneurship Hatchery since 2013.
- Recognized students via the co-curricular record for the competencies they gain through their roles on athletic teams, student government, cultural clubs, design teams or other campus organizations via the co-curricular record (CCR). Students can also access this official U of T document to find activities and organizations that are in line with their personal development goals.
  - In its pilot year (2013–2014), the CCR recognized 15 roles on selected student clubs and teams. In 2014–2015, this was expanded to 215 recognized roles.
- Offered two courses via the inverted classroom model, allowing students more time in class for inquiry, application and assessment of material with instructors.
- Implemented recommendations from the Core Curriculum Task Force to assist with transition from high school to university, including the development of APS100 - Orientation to Engineering.
- Placed 790 students — the largest cohort yet — in PEY internships with leading companies, including 79 outside of Canada in 2015–2016, compared to 581 and 34, respectively in 2011-2012.

**4.2.2 Engage more undergraduates in faculty research activities. Enhance summer opportunities for our undergraduates by expanding the Engineering Summer Internship Program (eSIP) and by increasing summer research opportunities both within the Faculty and through agreements with international institutions.**

- Increased undergraduate participation in summer research to 307 in 2016, up from 202 students in 2011.
- Created a new credit course, APS299 - Summer Research Abroad, for students who wish to receive degree credit for summer research.
- Increased the number of students participating in international summer research to 76 from 18 in 2011.
- Held the Undergraduate Engineering Research Day (UnERD), a one-day research symposium for students to celebrate undergraduate engineering research carried out over the summer and allow students to gain key competencies in abstract writing and networking. This annual event is held in August and features nearly 100 poster and podium presentations on a wide range of topics.

**4.2.3 Enhance our students' access to electives outside technical courses.**

- Developed and signed an Interdivisional Teaching Agreement with the Faculty of Arts & Science that includes an academic framework that enables the two Faculties to work together to achieve our educational mission for the benefit of students and faculty, and focus on pedagogy rather than funding. The agreement guarantees a number of course slots in the Faculty of Arts & Science for engineering students.

- Launched a new Faculty-wide Summer Leadership Program through ILead. This eight-week course 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.

**4.2.4 Enhance our undergraduate and graduate students' non-traditional educational opportunities, including international academic exchanges and internships, courses offered abroad, field courses, and credit for work in extracurricular activities such as design teams.**

- Celebrated the launch of several companies that received support from one or both of our entrepreneurship accelerators, Start@UTIAS and The Entrepreneurship:
  - 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.
- Supported students' entrepreneurial interests through idea markets, speaker series and hackathons at The Hatchery.
- Participated in the Globex Program at Peking University (PKU), an intensive four-week summer program with 17 MIE students and 5 faculty taking part since 2012.
- Established a cross-cultural capstone course with PKU, recently expanded to Tsinghua University, where student teams in each institution partner together to solve an industry sponsored problem. ~70 students have participated to date.
- Increased the number of students participated in outgoing exchanges to peer institutions to 89 from 61 in 2013. Institutions included: Massachusetts Institute of Technology, ETH-Zurich Swiss Federal Institute of Technology and National University of Singapore.
- Established a flex-time PhD option in several departments that allows students who are employed full-time and have a master's degree in engineering to pursue a PhD; this specialty degree is a partnership between a student, an employer and a supervising professor.

**4.2.5 Continue to inspire the Faculty's culture of teaching excellence and support teaching initiatives that improve student experience, support their connections with course content, increase in-class engagement and strengthen students' understanding of course relevance.**

- Launched the Engineering Instructional Innovation Program (EIIP) in 2013, which makes strategic investments that will lead to better pedagogy in selected courses and improvements in the learning experience for our students. In the most recent call for proposals, EIIP supported projects including: Parallel Classrooms; and Re-engineering Mathematics Education.
- Received recommendations from the Dean's Task Force for Core Curriculum Review in December 2014; appointed working group to guide and oversee the implementation of these recommendations to improve our first-year curriculum and overall student experience.

- Established an award for Sustained Excellence in Teaching to recognize exceptional faculty who have taught undergraduate Engineering students for at least 15 consecutive years and have previously won some other form of recognition of teaching excellence within the Faculty.

#### **4.2.6 Promote extracurricular activities through communications, faculty mentoring and suitable space and facilities.**

- Installed a large-scale projection system, tied to the Faculty's digital display network, which allows the Engineering Society and its affiliated clubs to display digital banners.
- Streamlined the process for students club funding by creating the Centralized Process for Student Initiation Funding (CPSIF), which allows student groups to apply to various funding resources from within the Faculty of Applied Science & Engineering in a single application.
- Held fourth annual Pink Shirt Day in 2016, to raise awareness about bullying and discrimination, complete with a photo booth where people recorded statements about diversity.
- Featured U of T Engineering Varsity athletes in student news publications.
- Appointed a working group to conduct an audit of the Faculty's makerspaces and develop recommendations for improvements and communication of availability.

#### **4.2.7 Actively engage and support students in their unique academic and non-academic experiences as soon as they enter our Faculty, so they can thrive throughout their studies.**

- Offered a wide range of academic supports, such as:
  - First-Year Foundations program, which helps students sharpen their technical skills, become familiar with the campus, meet future classmates and gain valuable advice from current students and professors;
  - embedded counsellors who provide guidance and identify students who may benefit from extra support;
  - Peer-Assisted Study Sessions (PASS), led by highly successful upper-year students; and
  - support for international students, including international student transition advising, online chats from June to September for international students to ask questions and receive assistance, and the International Foundation Program, which allows academically strong students to gain conditional admission as non-degree students while they complete intensive English-language training and the Engineering Strategies and Practice course series.
- Connected students with programs offered by the Centre for International Experience, including:
  - iConnect, an intercultural mentorship program; and
  - Step Up, a week-long, residential pre-orientation program that prepares international students for their studies at U of T, with the Engineering First-Year Office providing engineering-specific input.

#### **4.2.8 Engage Master of Engineering (MEng) students to improve the quality of their experience.**

- Initiated departmental MEng-only orientations to meet specific needs of professional graduate students, in addition to the Faculty-wide MEng orientation.
- Moved to a new online course evaluation system for graduate courses in fall 2014 to provide enhanced feedback to instructors on the quality of their teaching.
- Substantially expanded ELITE emphasis, offering 37 courses.
- Strengthened MEng offerings by launching program emphases in: Sustainable Energy, Advanced Manufacturing, Advanced Water Technologies & Process Design, Sustainable Aviation, and Financial Engineering. Total number of areas of emphasis is now 12.
- Created new MEng in Biomedical Engineering, a one-year program focusing on medical device design that received its first cohort in fall 2016.
- Continued 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 start-ups and bring their innovations to market.
- Provided MEng students with the opportunity to apply their knowledge and skills in multidisciplinary teams and address technical research challenges proposed by industry partners via the Multidisciplinary MEng Project, offered by the University of Toronto Institute for Multidisciplinary Design & Innovation (UT-IMDI).
- Offered MEng students internships with industry partners through UT-IMDI.

#### **4.2.9 Enrich graduate students' academic life and build a stronger sense of community among graduate students across the Faculty.**

- Offered Instructor Training Conference to assist teaching assistants involved with DEEP Summer Academy: in 2016, 110 people attended, up from 68 attendees in 2013.
- Created the Collaborative Program in Engineering Education (EngEd) in fall 2014 for master's and doctoral students from U of T Engineering and 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.
- Offered the Prospective Professors in Training (PPIT) program, which gives PhD candidates who are interested in careers in academia the opportunity to design courses and research programs; develop effective academic curriculum vitae, teaching dossiers and research statements; and prepare for academic job interviews.
- Initiated the development of a series of workshops geared towards professional development for PhD students who do not wish to pursue a career in academia. A formal program is planned for September 2017.

## 5. Research Foci

U of T Engineering's excellent research programs have contributed to our global ranking as the top engineering school in Canada and is a major factor in our ability to attract outstanding faculty and graduate students. Our strategic focus on cross-Faculty initiatives that nurture a culture of collaboration and cross-disciplinarily are key elements of our reputation and success.

We now have more than 25 multidisciplinary research centres and institutes, 11 of which were created in the past five years. Several of these new centres, including the Institute for Sustainable Energy, University of Toronto Transportation Research Institute, Institute for Robotics and Mechatronics, and the Identity, Privacy and Security Institute, bring together faculty members and graduate students from Engineering and the Faculty of Arts & Science, Dalla Lana School of Public Health, Munk Centre for Global Affairs, and the School for Public Policy and Governance to advance research to complex global problems. We have also enabled additional multidisciplinary research collaborations through the Dean's Strategic Fund for initiatives such as the Food and Nutrition Security Engineering Initiative, Engineering Education for Sustainable Cities in Africa, and Public Health Diagnostics Initiative.

In the past two years, we have solidified an already strong network of research partnerships with other U of T Faculties and affiliated hospitals through the Translational Biology and Engineering Program (TBEP), a key component of the Ted Rogers Centre for Heart Research, and Medicine by Design (MbD), both led by Engineering faculty members. TBEP currently includes eight principal investigators whose research focuses on stem cell technologies, cellular and tissue engineering techniques, cell signalling, experimental platform development and clinical research in heart regeneration, and was made possible through a generous donation from the Rogers family. MbD brings together more than 90 researchers from across U of T and the hospitals to make discoveries in regenerative medicine and cell therapy using engineering design principles and quantitative biological modelling. With its commercialization partner, the Centre for Commercialization of Regenerative Medicine (CCRM), MbD is also accelerating clinical translation and commercialization of these discoveries and strengthening Canada's position as a leader in regenerative medicine. The initiative is made possible in part by a \$114-million grant from the Canada First Research Excellence Fund, the largest single research grant in U of T's history.

We achieved our original Academic Plan goal of increasing our Tri-Council funding to \$25 million per year by 2015 in 2012–2013, three years early, and are making excellent progress toward our new goal of \$32 million by 2015–2016. In 2014–2015, the most recent year for which we have complete data, we reached a record \$31.8 million. The importance of this funding is underscored by the fact that the national reallocation of Canada Research Chairs (CRCs), which occurs every two years, is based on the proportion of Tri-Council and Networks of Centres of Excellence (NCE) funding that each university receives.

U of T Engineering's five-year cumulative share of NSERC funding was 9.3 per cent, greater than any other Canadian engineering school. We received seven new or renewed CRCs in 2016, bringing our total to 29. Today, U of T Engineering has 77 research chairs including 27 Endowed Chairs, 8 Industrial Research Chairs, 8 U of T Distinguished Professors and 5 University Professors. We recently received two new Collaborative Research and Training Experience (CREATE) grants, bringing our Faculty's total to eight. We have been successful in gaining research funds from a number of programs over the last five years including: two major Strategic Network grants (Smart Applications on Virtual Infrastructure, and Industrial Biocatalysis Network) totalling \$25.0 million, \$34.8 million in CFI funding, and \$38.4 million in NSERC Discovery Grants. In the most recent rounds, we received \$11.3 million for four Ontario Research Fund-Research Excellence (ORF-RE) projects, and six Early Researcher Awards.

Our success can be attributed, in part, to mechanisms we have implemented in recent years to assist faculty members in their pursuit of research and commercialization activities. Examples include: support for junior faculty members and emerging research leaders with grant preparation and identification of new industry partners; hosting panel sessional on best practices in research with a focus on partnership and collaborative research; holding workshops and internal peer reviews during award competitions; and providing operational support funding for large infrastructure projects.

The Faculty engages with more than 300 industry partners around the world through our research endeavours, capstone design projects and internships. Our two directors of corporate partnerships, who focus on government and international partnerships and foundation partnerships, respectively, work with faculty to identify areas where our partners' strategic medium-to-long term priorities overlap with ours, facilitating an approach that moves beyond the transactional one-time, project-based collaborations to one with greater opportunities. Each year, we host an industry partners reception to recognize existing partners and develop new relationships.

Strengthening our research infrastructure to be in line with our global reputation continues to be an area of focus. In addition to the previously mentioned grants and the

Centre for Engineering Innovation & Entrepreneurship (CEIE), which will house several of our multidisciplinary research centres and institutes, we secured an investment from the federal government's Post-Secondary Institutions Strategic Improvement Fund that, when coupled with matching funds from the Faculty, will result in \$31.6 million in renovations to 89 laboratory facilities, impacting over 330 researchers, students and staff.

## **RESEARCH FOCI: ACADEMIC PLAN PROGRESS HIGHLIGHTS**

### **5.1 Create new and support current research centres around strategic research themes that make significant, relevant impacts on society.**

- Built and implemented a process to review, phase out, and encourage EDU:Cs and EDU:Ds in their development and research.
- Since 2011, created the following EDUs:
  - Centre for Healthcare Engineering
  - Centre for Global Engineering
  - Identity, Privacy and Security Institute
  - Centre for Research in Sustainable Aviation
  - Centre for Power and Information
  - Centre for Aerial Robotics Research and Education
  - University of Toronto Transportation Research Institute
  - Centre for Advanced Coating Technologies
  - Toronto Institute of Advanced Manufacturing
  - Institute for Robotics and Mechatronics
  - Centre for Resilience of Critical Infrastructure
  - Centre for Management of Technology and Entrepreneurship
  - Institute for Leadership Education in Engineering
  - Institute for Sustainable Energy
  - University of Toronto Institute for Multidisciplinary Design & Innovation
- Partnered with the Faculties of Arts & Science and Medicine, the Leslie Dan Faculty of Pharmacy and U of T-affiliated hospitals in the creation of Medicine by Design (MbD), a regenerative medicine initiative made possible in part by a \$114-million grant from the Canada First Research Excellence Fund. MbD is led by IBBME Professor Peter Zandstra and includes 16 researchers from our Faculty.

### **5.2 Increase our Tri-council funding level to \$25 million per annum by 2015.**

- Reached goal of \$25 million per year in Tri-Council funding in 2012–2013, three years earlier than originally targeted. Subsequently increased goal to \$32 million by 2015–2016.
  - Faculty achieved a record \$31.8 million in 2014–2015, which puts us in an excellent position to reach our goal of \$32 million by 2015–2016.



**5.3 By 2015, increase the number of Canada Research Chairs by eight (to a total of 30), increase Industrial Research Chairs by six (to a total of 10) and increase Endowed Chairs and Limited Term Chairs by 13 (to a total of 40).**

- Faculty is home to 77 research chairs held by 69 individual chair holders. These chairs include Canada Research Chairs, endowed chairs, NSERC Industrial Research Chairs, U of T Distinguished Professors and University Professors.
- Continue to share best practices through the Faculty's Research Committee to foster growth of sponsored research, which in turn impacts the Faculty's Canada Research Chair allocation.

**5.4 Develop additional funding sources through the Social Sciences and Humanities Research Council (SSHRC), the Canadian Institutes of Health Research (CIHR), corporations, industries and international granting agencies.**

- 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. In an initial round of funding announced in March 2016, nine projects received seed grants.
- Increased the amount of CIHR funding from \$1.4 million in 2010–2011 to \$3.2 million in 2014–2015.

**5.5 Support junior faculty members and emerging research leaders to ensure that they successfully secure external research funding from industry, federal and provincial sources.**

- Established Best Practices in Research, a new lunchtime panel series that raises awareness and supports emerging research leaders.
- Established a peer review or mentorship program in each department to support and guide faculty members in the development of their NSERC Discovery Grant (DG) and Research Tools and Instruments (RTI) grant applications.
- Prepared junior faculty to apply for Early Research Awards (ERA) by hosting a panel called Succeeding in the ERA and initiating an internal expert review during the competition to critique each of the Faculty's applications.
- Created the Percy Edward Hart and Erwin Edward Hart Professorships (with income from the Hart Trust); awarded seven faculty members, each within the first 10 years of his/her academic career, \$75,000 per year for three years for research and graduate student support.

## **5.6 Raise awareness and promote our research contributions and breakthroughs with peers, funding agencies, industry and the public.**

- Mapped and linked Advancement and Research resources via Research Impact Narratives lunchtime speaker series.
- Created the Research Leader Award in 2012–2013 to honour a faculty member or team that has shown leadership in innovative, interdisciplinary and/or collaborative research initiatives that have enhanced the Faculty’s research profile within the broader community.
- Produced several new research brochures on water, advanced manufacturing, healthcare engineering, nanoengineering and sustainable mining to support corporate outreach activities and industry partnerships.
- Launched a number of strategic initiatives, including proactive media outreach, and enhanced online presence and improved marketing materials, aimed at strengthening our visibility and our reputation for excellence.
- Participated in the University of Toronto Science & Engineering Engagement event for Sustainability & Engineering, with a presentation on environmentally sustainable aviation.

## **5.7 Generate synergistic research partnerships with peer institutions within Canada, and strategic international partners, while taking on leadership roles at the national and international levels.**

- Developed connections between Advancement, Vice-Dean Research and Professional Experience Year (PEY) offices to track industry partners interested in Highly Qualified Personnel and student hiring, and to leverage existing PEY relationships for philanthropy and research.
- Enhanced collaboration with the Vice-President, International and the Vice-President, Research and Innovation on international partnership development.
- Partnered with multiple Canadian institutions on NSERC CREATE, Strategic Research Network, and CFREF applications.
- Successfully leveraged industrial partnerships, which led to tremendous growth in NSERC funding over the past decade (accounted for 44 per cent of our NSERC funding alone in 2014–2015).
- Collaborated 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 and U of T spinoffs such as Crowdmark.

## **5.8 Increase participation and provide leadership on external review committees in granting agencies such as the Natural Sciences and Engineering Research Council (NSERC), Ontario Centres of Excellence (OCE), and the Ontario Ministry of Research and Innovation (MRI).**

- Partnered with the Office of the Vice-President, Research and Innovation and the Ontario Council of University Research to successfully make the case to Ontario’s Ministry of Research and Innovation to improve transparency in its review process for the Ontario Research Fund – Research Excellence (ORF-RE) program.

- Worked with Ontario Centres of Excellence towards harmonizing the application process of OCE partnerships grants and allied NSERC Collaborative Research and Development submissions.
- Continued to engage with the Ontario Centres of Excellence to provide matching support for the Heffernan Entrepreneurship Fellowships.
- Participated in the 2013 announcement by the Ministry of Research and Innovation of \$35 million in matching funding support for U of T researchers.
- Contributed our expertise on NSERC and other government agency panels; the faculty members who participate not only strengthen these organizations, but also gain valuable insight into how we can enhance our own programs and internal systems to align with the best practices observed in their reviews.

### **5.9 Enhance multidisciplinary, collaborative research endeavors.**

- Co-hosted Engineering Global Health Symposium.
- Completed the \$10-million laboratory for the Translational Biology and Engineering Program (TBEP) in the MaRS Centre Phase 2 (MaRS2), part of the Ted Rogers Centre for Heart Research and established the Translational Biology and Engineering Program (TBEP) led by Engineering faculty in collaboration with the Faculties of Medicine and Dentistry.
- Partnered with the Faculties of Arts & Science and Medicine, the Leslie Dan Faculty of Pharmacy and U of T-affiliated hospitals in the creation of Medicine by Design (MbD), a regenerative medicine initiative made possible in part by a \$114-million grant from the Canada First Research Excellence Fund, the largest research grant in U of T's history. MbD is led by IBBME Professor Peter Zandstra and includes 16 researchers from our Faculty.
- Enabled 13 collaborative research centres and initiatives through the Dean's Strategic Fund, including the Centre for Aerial Robotics Research and Education.
- Established EMH:Seed: Seeding Innovation Research Partnerships to provide funding to enable significant, externally-supported projects and encourage multidisciplinary collaborations between Engineering and Medicine.

### **5.10 Engage more undergraduate and international graduate students in faculty research activities**

- Increased undergraduate participation in summer research; up from 202 students in 2011 to 307 in 2016.
- Increased the number of students completing summer research abroad to 76 in 2016–2017 from 18 in 2011–2012.
- Engaged students on the topic of undergraduate research opportunities at the Dean's Town Hall.
- Held every summer, the Undergraduate Engineering Research Day (UnERD), a one-day research symposium for students to celebrate undergraduate engineering research carried out over the summer and allowing students to gain key competencies through abstract writing and collaborative networking. This annual event is held in August and features nearly 100 poster and podium presentations on a wide range of topics.

## 6. Outreach, Collaboration and Influence

U of T Engineering continues to build on our global reach through strategic institutional partnerships, student mobility, international student recruitment and other initiatives to enhance our institutional contributions and influence. We create formal partnerships for academic, research, and/or student exchange where we have existing collaborations and relationships, and in areas that are mutually beneficial.

Over the past few years, we have developed relationships with key institutions around the world, including Addis Ababa University, Peking University, Hong Kong University of Science and Technology, and ETH Zurich. In 2015-2016, we formalized two agreements with Shanghai Jiao Tong University (SJTU), a long-standing partner with our aerospace program. These agreements enable SJTU master's students to obtain a U of T Engineering MEng, and select students to participate in a joint placement PhD. Since 2013, our Faculty created three 3+1+1 programs with select institutions in Asia, one of which is in the process of being converted to a dual degree. These unique programs allow top third-year engineering students to apply to U of T Engineering to complete their fourth year here while gaining conditional acceptance into one of our MEng programs. To date, 12 students have participated. We also expanded our international capstone course with Peking University to Tsinghua University. Our students recognize the importance of global fluency and are participating in increasing numbers in summer research abroad and international Professional Experience Year (PEY) internships.

Locally, we engage more than 9,000 pre-university students through our outreach programs. Increasing awareness of the engineering profession and the role it plays in society is critical to our future success and starts with students as early as Grade 3. This awareness is accomplished through a number of programs targeted at both students and teachers in middle and high school. In May 2016, we hosted a one-day workshop — InnovateU — in partnership with Google Canada and Actua, that attracted more than 1,400 students and teachers to learn more about science, technology, engineering and math (STEM). We reached more than 7,000 high school students through our Da Vinci Engineering Enrichment Program (DEEP) Summer Academy, one-third of whom were women. We continue to develop programs and reach out to underrepresented communities, particularly women and Indigenous youth, an area we recognize needs additional effort. Steps taken this past year include the creation of a Dean's Advisory Committee on Indigenous Engineering Initiatives & Outreach as well as the hiring of a Director, Engineering Pathways and Indigenous Partnerships, to engage with Indigenous

communities with the goal of increasing the rate of participation and academic success of Indigenous students in Engineering.

Within U of T, our Faculty continues to enhance our inter-Faculty partnerships in research and education. In 2015, we signed an interdivisional teaching agreement with the Faculty of Arts & Science to formalize our relationship and to enable us to work together more effectively in the delivery of technical and math courses, and increase the availability of spots for Engineering students in non-technical electives. The Centre for Global Engineering (CGEN) works closely with the Rotman School of Management and the Dalla Lana School of Public Health on JCR1000Y, a project-based course that brings together students from different disciplines to work in teams to address a major global challenge. U of T Engineering also established a graduate collaborative program in Engineering Education in 2014 with the Ontario Institute for Studies in Education (OISE) that enables graduate students to join a community of scholars interested in research and learning at the intersection of education and engineering practice.

Among our many research centres and institutes, we work collaboratively with other Faculties and institutions to develop solutions to pressing challenges. This includes the Southern Ontario Centre for Atmospheric Aerosol Research (SOCAAR), an interdisciplinary centre for the study of air quality, with a focus on how aerosols impact human health and the environment. Principal Investigators come from a number of departments in Engineering, Arts & Science, as well as the Dalla Lana School of Public Health. The University of Toronto Transportation Research Institute (UTTRI) works with faculty in Arts & Science, the Martin Prosperity Institute, Munk School of Global Affairs and School of Public Policy & Governance to study and develop urban transportation systems and solutions. These, in addition to large-scale projects such as the Translational Biology and Engineering Program (TBEP) and Medicine by Design (MbD) mentioned in the research chapter, ensure that our Faculty continues to play an integral role in the University's research agenda.

Our rich network of more than 48,000 alumni is one of our most valuable resources. They are our strongest ambassadors, and their continued commitment to the Faculty enables us to create unparalleled opportunities for our students. Our alumni act as mentors through our formal programs as well as through The Entrepreneurship Hatchery. They are our industry partners in research collaborations and capstone design projects, and employers through our PEY program. Members of our Skule™ family also provide invaluable advice and connections on departmental advisory and industry boards, as well as on our Faculty Campaign Executive. They also help shape the future of our student body by assessing applications through our broad-based admissions system.

We now have Engineering Alumni Association chapters in Calgary, Silicon Valley, and Hong Kong. These regions are particularly active and assist us greatly in recruitment and outreach. We host more than 60 alumni events per year, including our BizSkule speaker series and networking receptions around the world. Our alumni in Asia are also dedicated champions of our Faculty and students. They have generously supported the Centre for Engineering Innovation & Entrepreneurship (CEIE) and continue to be actively involved throughout the region through philanthropy, career and social events. In addition to the Dean's annual visits to the area, we are pleased to have accompanied University of Toronto President Meric Gertler and Vice- President of University Advancement David Palmer to Singapore to connect with our influential alumni and facilitate discussions regarding the University's three strategic priorities and alumni participation on the University's International Advisory Council.

Since the launch of Boundless: The Campaign for the University of Toronto in 2011, we have raised \$180 million of our \$200 million goal, including \$29.3 million in 2015–2016. Our Skule™ community has rallied around these efforts, particularly the CEIE. Our new building is designed to foster an environment of multidisciplinary education and research, bringing together faculty, students, staff, alumni and industry partners as we shape the future of engineering.

## **OUTREACH, COLLABORATION AND INFLUENCE: ACADEMIC PLAN PROGRESS HIGHLIGHTS**

### **6.1 Better understand the breadth of the Faculty's current outreach, collaborative and influencing efforts, then efficiently manage, support, develop and communicate these activities.**

- Developed a corporate brochure that highlights our key research strengths and the benefits of partnering with U of T Engineering; the brochure can be customized to target specific audiences, or feature a specific department or research area.
- Conducted a readership survey for our Skulematters alumni magazine, following the completion of the issue on entrepreneurship and commercialization, to ensure we are meeting the needs and interests of our alumni; feedback gathered was used to enhance the content and layout in the fall 2015 Skulematters highlighting "Women in Engineering: A Tradition of Excellence."
- Distributed a marketing insert through Skulematters to more than 600 alumni in the Asia-Pacific region that demonstrates our many research, student and alumni connections in the regions, fostering stronger ties between Asia-Pacific alumni and U of T Engineering.

### **6.2 Continue building meaningful involvement and relations with Engineering alumni.**

- Held 84 networking and professional development events for alumni around the world in 2015–2016 alone. These events included: a Spring Reunion event for alumni who graduated between five and 15 years ago; the Engineering Society Heritage Awards Celebration; and four BizSkule events in Toronto, Calgary and California’s Silicon Valley.
- Grew our Alumni Mentorship Program in 2015–2016, with 161 mentors and 280 mentees taking part – increases of 33% and 16% respectively over the previous year.
- Created the Young Alumni Board, comprised of recent graduates who are recognized leaders in their fields and philanthropic supporters of the Faculty, to engage and involve younger alumni in fundraising and community-building initiatives.
- Rolled out the Graduway alumni network social media platform across three departments in 2015–2016, with two more expected to launch in 2017. Graduway enhances our ability to connect with our global community of alumni and improves engagement, including in mentorship and volunteer opportunities.

### **6.3 Strengthen relationships with other University of Toronto Faculties.**

- Launched the Master’s/PhD collaborative program in Engineering Education with the Ontario Institute for Studies in Education (OISE).
- Collaborated with the Faculties of Medicine, Pharmacy and Arts & Science and hospital partners, in Medicine by Design (MbD), an initiative that uses engineering design principles and quantitative biological modelling to advance discoveries in regenerative medicine.
- Established the Translational Biology and Engineering Program (TBEP) in collaboration with the Faculties of Medicine and Dentistry.
- Offered the Interdisciplinary Approach to Global Challenges courses, through Centre for Global Engineering, which brought together graduate students from U of T Engineering, the Dalla Lana School of Public Health, the Rotman School of Management and the Munk School of Global Affairs.
- Established the University of Toronto Transportation Research Institute (UTTRI), an initiative that brings U of T’s considerable depth and breadth of research to bear on urban transportation problems from the perspectives of engineering, humanities and science.

### **6.4 Further develop sustainable collaborations with industry partners, and expand established partnerships with affiliated hospitals and research institutes.**

- Fostered and celebrated our collaborative successes with our industrial and government partners through our Annual Reception for Engineering Industry Partners. November 2016 marked the fifth time has been held.
- Engaged with numerous industry clients such as Pratt & Whitney and Magellan Aerospace for summer/multidisciplinary capstone design projects through the University of Toronto Institute for Multidisciplinary Design & Innovation (UT-IMDI).
- Continued to offer mentorship and sponsorship opportunities for alumni in industry through The Entrepreneurship Hatchery.
- Published second external annual report – Innovation Lives Here – Year in Review 2015, in summer 2015 to share key achievements with industry partners, alumni and prospective donors.
- Established the NSERC Design Chair Multidisciplinary Capstone Project (MCP) Lead Committee, which includes 12 industry representatives and submitted its renewal proposal for 2017-2020.

## **6.5 Further develop connections with local communities, businesses and the City of Toronto.**

- Worked to improve social services with the Centre for Social Services Engineering, which applies industrial and systems engineering techniques — including mathematical analysis, big data and machine learning — to improve the delivery of goods and services to vulnerable populations in urban centres.
- Continued for a fifth year the Sky Garden, a roof-top garden on the Galbraith Building that in 2015 donated more than 225 kilograms of vegetables to local charitable organizations.
- Engaged and worked with local communities through the UTTRI, with several initiatives including a workshop on Travel Methods for the Greater Golden Horseshoe, the Intelligent Transportation Systems Research Day, and the Freight Day Symposium.
- City of Toronto tested U of T Engineering graduate Samah El-Tantawy's (CivE) smart traffic light system on 60 downtown Toronto intersections, reducing delays by as much as 40%.

## **6.6 Build upon high school outreach and continue to assess our pre-university activities with the goal of optimizing faculty and student involvement.**

- Inspired more than 9,000 youth through our pre-university outreach programs, including the in-school workshop program for students in Grades 3 to 8, March Break programs, Saturday workshops, and the Da Vinci Engineering Enrichment Program (DEEP), reaching students in Grades 3 through 12 and allowing participants to explore cutting-edge engineering applications such as sustainable energy, biomedical engineering and robotics.
- Conceived and launched the 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. In 2016, 91% of the 87 students participating in GLEE accepted our offers of admission, compared with 77% in 2013.
- Launched the DEEP Saturday Workshops, which allow participants to explore cutting-edge engineering applications, such as sustainable energy, biomedical engineering and robotics.
- Visited California science fairs to engage with top Grade 10 and 11 students and offer scholarships to DEEP Summer Academy.
- Hosted Innovate U, Canada's largest science, technology, engineering and math (STEM) event for children in Grades 3 to 8 on May 13, 2016. This one-day workshop was run in partnership with Google Canada and Actua and attracted more than 1,400 students and teachers from across the Greater Toronto Area.

## **6.7 Develop strategic relationships with desirable peer, national and international Engineering schools.**

- Established U of T Engineering as a leading partner in Brazil's Ciência sem Fronteiras (formerly Science Without Borders) program, welcoming 490 students from September 2012 through December 2015. The final year of the program was 2015–2016.
- Enabled our students to gain cross-cultural fluency and experiences that enhance their understanding of complex global challenges through international educational exchanges, research programs and professional placements.



- 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.
- 79 students gained invaluable international work experience by completing PEY internship placements outside Canada in 2015-2016.
- Further strengthened our relationship with Shanghai Jiao Tong University (SJTU), China through a memorandum of understanding to support aerospace research and education collaboration.
- Developed 3+1+1 programs with South China University of Technology, Shanghai University, and Tianjin University, that will allow select top students from these institutions to complete their fourth year of undergraduate studies at U of T Engineering, with conditional acceptance to our MEng program.
- 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.
- 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.

#### **6.8 Increase influence in government and public policy decisions.**

- Engaged with the Office of the Vice-President, Research and Innovation (OVPRI) and the Ontario Council of University Research (OCUR) to successfully make the case to Ontario's Ministry of Research and Innovation to improve transparency in its review process for the Ontario Research Fund-Research Excellence (ORF-RE) program.
- Presented highlights of U of T Engineering sustainability research to NSERC staff in Ottawa in February 2015.
- Participated in a 2013 announcement by the Ontario Minister of Research and Innovation of a \$35-million grant from the Ontario government in support of U of T research infrastructure.
- Met with several ministers and Tri-Council leadership to discuss entrepreneurial advances and research infrastructure in the Faculty.

#### **6.9 Develop a culture of stewardship and gratitude to the alumni and donors who provide philanthropic support to the Faculty.**

- Publicly recognized several major donors through online news articles and print publications.
- Launched the Faculty's component of Boundless: The Campaign for the University of Toronto in September 2012 at an event attended by more than 600 members of the Engineering community.
- Recognized donors and acknowledged their generous gifts in support of the Faculty via the Annual Dean's Dinner
- Hosted a dynamic groundbreaking ceremony for the Centre for Engineering Innovation & Entrepreneurship (CEIE) that engaged donors and the broader U of T community.
- Celebrated and recognized alumni for their outstanding achievements via the Engineering Alumni Association Awards Dinner.

- 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.
- Launched our first Spring Reunion Giving campaign in 2016, including both online and direct mail giving options.

**6.10 Encourage the participation of administrative staff in professional associations related to their area of expertise, and in the mentoring programs offered by the University.**

- Established a Human Resources Office in summer 2013 to support Faculty objectives.
- Secured funding and related support from the Office of Student Life for a professional development day for all registrarial staff at U of T held in November 2012, with more than 300 staff attending from the three campuses.
- Established a series of workshops through the Organizational Development and Learning Centre (ODLC) for staff advisers and student life professionals; ODLC now has a number of courses to assist staff working closely with students.
- Explored opportunities for formal and informal initiatives to encourage staff development through regular meetings of departmental business officers and our new Human Resources office.
- Ensured that senior administrative staff were nominated for and participated in the University's New Manager Academy and Business Manager Leadership Program.
- Over the past five years, supported the participation of 16 staff through the Rose Patten Mentorship Program, a formal and highly competitive program through the University of Toronto.

## 7. Resource Allocation

Strengthening our resources — personnel, space, budget and infrastructure – is critical to our ability to achieve our mission and Academic Plan goals. They underpin each of the strategic areas outlined in our plan: our culture of excellence, reputation, student experience, curriculum and experiential learning opportunities, research and innovation, and outreach, collaboration and influence.

Total annual revenues have increased to \$210.0 million over the past five years, from \$159.1 million in 2011–2012, while total costs have also risen. Our net revenue has increased by 7.8 per cent to \$116.1 million year over year, with a compound annual growth rate of 7.6 per cent over the past ten years. These strategic increases in revenue, coupled with responsible fiscal management, have enabled us to invest in excellence in research, education, and student experience. The implementation of our Faculty budget model has been tremendously successful and allows departments and institutes to make strategic financial decisions while advancing their academic priorities. As a Faculty, we have strengthened our position, infrastructure capacity, and increase our unencumbered operating contingency reserves.

In 2011, we launched the Dean’s Strategic Fund to provide start-up funding for projects that advance our Academic Plan goals. Over the course of the past five years, we have committed more than \$24 million to projects that improve the student experience and advance multidisciplinary research. Key criteria for funding are the commitment of multi-departmental collaborators and broad impact. Examples of funded projects include the expansion of The Entrepreneurship Hatchery to include an incubator for graduate-level, research-driven start-ups; the expansion of the MIE machine shop to students from all departments; and initial funding for the Institute for Sustainable Energy and the Toronto Institute for Advanced Manufacturing, both of which bring together faculty from multiple departments and across the university. As part of the Dean’s Strategic Fund, we also created the Engineering Instructional Innovation Program (EIIP) to support the development of novel pedagogies. Over the past three years, the EIIP has funded projects to re-engineer mathematics education, develop effective teamwork skills in technical courses using team-based learning, create parallel classrooms for MEng education in mechanical and aerospace engineering, and enhance curriculum delivery at the IBBME undergraduate teaching lab.

The Centre for Engineering Innovation & Entrepreneurship (CEIE) is designed to further enrich student experiential learning and heighten opportunities for cross-disciplinary

research, and will launch the beginning of a new era in U of T Engineering. Students will benefit from state-of-the-art Technology Enhanced Active Learning (TEAL) rooms, design-meet rooms, and a new light fabrication facility. The CEIE will also free up space in our existing Engineering buildings as we transition ownership of some of the classrooms in the new building to Academic and Campus Events (ACE). Some of these spaces will then be retrofitted to expand the number of research labs and create multi-purpose teaching labs that can be used for courses across the Faculty.

Recent major research infrastructure projects include the Translational Biology and Engineering Program Lab which completely renovated the 14th floor of the MaRS2 tower to include offices, meeting facilities and an advanced research lab. The Faculty created additional space on top of the Wallberg Building for BioZone, which was completed in three phases. The Ontario Centre for the Characterization of Advanced Materials (OCCAM) was completed in 2016 and made possible by strategic investments from CFI, MRI and Hitachi High-Technologies Canada.

We have made significant progress over the past five years in completing major upgrades and renovations to research, teaching and student space but there is still much work to be done to bring our facilities in line with our reputation as the premier engineering school in Canada. In July 2016, we received confirmation that the federal government's Post-Secondary Institutions Strategic Investment Fund (SIF) had accepted our proposal. Through funding from the federal government, Faculty and departments, we will invest \$31.6 million to renovate 89 laboratory facilities across our Engineering buildings. This will benefit more than 330 U of T Engineering researchers, staff and graduate students. Renovations must be complete by April 2018. In parallel to the SIF, we launched the Dean's Infrastructure Improvement Fund (DIIF) to fund large-scale infrastructure improvements within the Faculty, in partnership with departments and institutes. Eleven projects were approved, totalling more than \$17 million in improvements to teaching and lab spaces that will enhance the student experience.

Philanthropic fundraising is critical to ensuring we can advance both our academic and capital priorities. As mentioned in the Outreach, Collaboration, and Influence chapter, we have raised \$180 million of our \$200 million Boundless campaign goal. We have set a number of goals for principal, major, planned, and annual and leadership giving, and have attracted strong support for research, education and entrepreneurship across diverse disciplines. We will continue to strengthen our relationships with alumni and industry to further our goals in this area.

## RESOURCE ALLOCATION: ACADEMIC PLAN PROGRESS HIGHLIGHTS

### **7.1 Maximize quality academic time and effectiveness by increasing engagement in high value activities that support students' academic experience, contribute to knowledge creation, and advance engineering research frontiers.**

- Made progress towards our goal of 40% graduate students, now at 32.9% compared to 27.3% in 2011-2012.
- Created senior-level administrative support positions to further the mandates of BioZone, the University of Toronto Institute for Multidisciplinary Design & Innovation (UT-IMDI), and the Institute for Water Innovation which has a new focus on sustainable water management for water resource industries; added two administrative directors to further the mandates of BioZone and the Institute for Water Innovation, and one administrator to support the Institute for Robotics and Mechatronics and the Toronto Institute of Advanced Manufacturing.
- Reviewed with our academic units the local workload policies in conjunction with the University's Workload Policy and Procedures for Faculty and Librarians.

### **7.2 Place emphasis on Engineering's strategic research areas when considering faculty hires.**

- Conducted two Faculty-wide multidisciplinary academic searches targeted at interdisciplinary, diversity, research and teaching excellence resulting in 7 outstanding female hires with budgetary cross-appointments in two academic units each.
- Created stronger ties among department and increased multidisciplinary synergies by championing the highest academic standards in these faculty appointments.
- Hired NSERC Design Chair in Multidisciplinary Design and commenced development of a suite of industry-supported multidisciplinary senior design projects to unite design initiative across the Faculty and foster collaboration, design and innovation.

### **7.3 Provide a supportive environment for faculty members through mechanisms such as start-up funding, teaching skills workshops, and assistance via Associate Chairs, Research to create successful research proposals.**

- Held lunchtime panel series for faculty on best practices in research, including a session on collaborative and partnership research.
- Prepared junior faculty to apply for Early Research Awards (ERA) by hosting a panel called "Succeeding in the ERA" and initiating an internal expert review during the competition to critique each of the Faculty's applications.
- Continued to share best practices through the Research Committee to foster growth of Tri-Council sponsored research, which in turn affects the Faculty's Canada Research Chair (CRC) allocation.
- Initiated a year-long teaching and learning workshop series coordinated jointly by the office of the Vice-Dean, Undergraduate, the Teaching Methods and Resources Committee, and students in the Masters/PhD collaborative program in Engineering Education.

- Established a peer review or mentorship program in each department to support and guide faculty members in the development of their NSERC Discovery Grants (DGs), Discovery Accelerator Supplements (DAS), and Research Tools and Instruments (RTI) grant applications.

**7.4 Improve our chances of being awarded funding for capital projects by pre-planning for various opportunities consistent with our goals and suitable for external funding sources such as CFI, Ontario Ministry of Training, Colleges and Universities (MTCU) and other capital grants. Increase the quality and quantity of space particularly through fundraising for new and revitalized buildings.**

- Renovated a number of existing facilities and created new ones through strategic investments. Examples include the Translational Biology & Engineering Program (TBEP) Lab on the 14th floor of the MaRS Discovery District West Tower and BioZone on the third and fourth floors of the Wallberg Building. In these facilities, shared resources bring researchers together for interdisciplinary research.
- Increased total Canada Foundation for Innovation (CFI) funding over the last five years to \$34.8 million, compared with \$27.8 million in the five years leading up to 2010.
- Continued advocacy to governments for infrastructure support. For example, in the 2016 provincial budget, \$15 million was allocated to support the construction of the Centre for Engineering Entrepreneurship & Innovation (CEIE), which speaks to the strategic alignment of our goals with those of those of provincial policy-makers.

**7.5 Enhance teaching and design facilities, upgrade undergraduate laboratory space, and make flexible space available for extra-curricular activities.**

- Committed more than \$5.5 million through the Dean's Strategic Fund and Dean's Infrastructure Improvement Fund to support additional student laboratory upgrades.
- Consolidated student club space at 256 McCaul Street and 701 Spadina, including all music clubs, establishing a new multi-purpose room for events and rehearsals.
- Supported new initiatives to upgrade facilities and equipment through the Dean's Strategic Fund.
- Continued to evaluate the renovated Sandford Fleming TEAL room to aid in the final design of the TEAL spaces in the CEIE.
- Expanded the IBBME Teaching and Design Studio laboratories.
- Designed innovative teaching and design spaces in the CEIE.
- Initiated a Faculty-wide review of makerspaces to inventory and align resources available to students and develop a plan to expand access.

**7.6 Provide reliable, accessible, effective computing services; create study spaces within and outside computer laboratories, library and classrooms so as to enhance interactive learning and socialization where today's student 'lives'.**

- Initiated renovation in the Lassonde Mining Building for a student study area and conferencing centre.

- Added new study spaces to Bahen Centre and Wallberg Building inventory of hallway seating to enhance interactive learning and socialization.
- Approved funding for several Dean's Strategic Fund proposals to improve design, club, and meeting spaces throughout the Faculty.

**7.7 Encourage timely degree completion among doctoral stream students; increase research funding and graduate fellowships to support graduate students.**

- Held time to graduation to an average of 5.3 years for PhD students (compared to 5.5 for UofT overall) and 2.0 years for MSc students.
- Increased total graduate funding \$44.8 million in 2014–2015, up from \$38.2 million in 2011–2012.

**7.8 Establish a strong Case for Support that addresses the Faculty's resource requirements and aligns the Faculty's critical need for improved space in the context of addressing educational and research priorities.**

- Designated nearly half of all funds raised in 2014–2015 to research, student experience and programs, and student scholarships and awards.
- Raised close to \$80 million to date in support of the CEIE building, the cornerstone of our Engineering campaign.
- Continued construction of the CEIE and established four 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.

**7.9 Increase long-term philanthropic support by strengthening the culture of advancement within the Faculty.**

- Increased outreach to alumni by creating formal Engineering Alumni Association chapters in Calgary, Silicon Valley and Hong Kong.
- Greatly improved engagement of the Toronto chapter of the Engineering Alumni Association by encouraging active participation in strategic Faculty events such as Convocation Plaza, Spring Reunion and the U of T Arbor Awards.
- Established the Young Alumni Board, composed of recent graduates who are recognized leaders in their fields and philanthropic supporters of the Faculty, to engage and involve younger alumni in fundraising and community-building initiatives.
- Partnered with the Engineering Society to launch Skule™ Alumni Outreach (SkuleAO), a student-run program to assist alumni who wish to support and enhance the experiences of current students.

## 8. Next Steps

Multidisciplinary Collaboration – Innovation – Diversity – Excellence. These have become the guiding principles of U of T Engineering. We will continue to use these tenets as foundation on which we build our future. Our Faculty will undergo an external review in early 2017 as part of the University's governance processes. We will utilize the reviewers' recommendations, along with our reflective self-study, to assist us in our next round of academic planning. As a Faculty, we will continue to build on the strengths of our departments, institutes and community of partners to develop further synergies across research initiatives and educational programming in a thriving, enriching, and supportive academic environment.