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The ability to work seamlessly across cultures and borders is an essential competency of the 21st century engineer. At U of T Engineering, our outlook and impact are global.

We attract a diverse range of students from Canada and around the world and provide boundless opportunities for them to study, work or pursue research both within and outside of Canada. These include exchanges arranged either through the Centre for International Experience or through our many reciprocal agreements with partner institutions around the globe. Each year, our students work in full-time positions with leading companies worldwide through the Professional Experience Year Co-op Program. We also provide cross-cultural educational opportunities, such as MIE's international capstone course, which enables our students to collaborate closely with teams from peer institutions in China on projects brought forward by external sponsors.

Our Centre for Global Engineering (CGEN) inspires students to think critically about the global context in which new technologies must be deployed. Through undergraduate and graduate courses, cross-disciplinary certificates, research fellowships and embedded projects, CGEN emphasizes the need to develop engineering approaches to meet the needs of local communities. With a new home in the Myhal Centre for Engineering Innovation & Entrepreneurship, CGEN will continue to catalyze research and educational initiatives that provide global perspectives for students across all of our programs.

Through these initiatives and many others, we prepare our graduates to lead in the international marketplace and to ensure that the new products, industries and businesses make positive and lasting contributions in Canada, and around the world.

International Students and Exchanges

In addition to our outstanding international reputation for excellence in research and education, our strategic initiatives attract top students from around the world to U of T Engineering. These include scholarships and structured degree partnerships with specific institutions, countries or regions. In 2017–2018, our international applications for undergraduate studies rose 16.5% over the previous year. International applications for our MASc programs increased by 24.8%, and those for PhD programs increased by 34.3%. Currently, 28.6% of our undergraduate students and 32.4% of our graduate students come from outside of Canada.

Some of our strategic international initiatives include:

- **International Foundations Program (IFP):** IFP enables academically strong students who do not meet the University's minimum English proficiency requirements to receive conditional offers of admission as non-degree students. After completing an intensive, eight-month English language program as well as our Engineering Strategies & Practice course, these students continue into a Core 8 engineering program. Sixteen students joined our Faculty through this program in 2017–2018.
- **MasterCard Foundation Scholars Program:** Funded by the MasterCard Foundation, this program provides talented students from economically disadvantaged communities, primarily in Sub-Saharan Africa, with access to quality and relevant education. Five MasterCard Foundation Scholars joined the entering class at U of T Engineering in 2017–2018, bringing the total number of recipients in our Faculty to 28 since 2013.
- **U of T Engineering International Scholar Award:** Established in 2014, this award provides full support over four years for academically accomplished international undergraduate students with demonstrated leadership. In the fall of 2017, the three newest recipients of this award joined the Faculty from schools in India, Trinidad and Tobago and the United States. They joined five other recipients, representing Jordan, New Zealand, Singapore and Turkey. Following the establishment of the Lester B. Pearson International Scholarships, this award has been redesigned to support a larger number of international students from underrepresented regions in Latin America and Sub-Saharan Africa, with the initial targeted cohort set at 17 students for fall 2018.
- **Lester B. Pearson International Scholarship:** Established in 2017, this university-wide, four-year undergraduate scholarship recognizes exceptional academic achievement, creativity, leadership potential and community involvement. Four students in our Faculty received this award in its initial cohort, representing Bangladesh, India, Malaysia and Trinidad and Tobago.

U of T Engineering also offers numerous opportunities for our students to gain international experience, through such initiatives as:

- **Professional Experience Year Co-op Program (PEY Co-op):** PEY Co-op students work for 12 to 16 months in companies across Canada and the world after second or third year. In 2017–2018, our students undertook 66 international placements — 48 in the United States and 18 in other countries, including Belgium, Botswana, China, Japan, Switzerland and the United Kingdom. *(For more information on PEY Co-op, see Chapter 4: Cross-Faculty Education & Experiential Learning.)*
- **Summer Research Abroad, Structured Exchange Pathways and other exchange programs:** These programs are administered by U of T's Centre for International Experience or coordinated by the Faculty, and enable students to conduct research internships or pursue academic courses at partner institutions abroad. In 2017–2018, 74 students participated in these exchange programs.

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

International Agreements

Strategic partnerships with our peer institutions around the world enable us to create pathways for students to gain international experience and enhance their global fluency. These include course-based and research exchanges, as well as cross-cultural engineering design courses, dual-degree programs and opportunities for international students to streamline their applications to our graduate programs, such as the MEng.

As of June 2018, our Faculty had more than 25 active international agreements, with access to other top institutions through University-wide partnerships.

In 2017–2018, we entered into new agreements to create International Doctoral Clusters (IDCs) with two institutions:

- National University of Singapore — IDC on cybersecurity
- Hong Kong University of Science & Technology — IDC on semiconductor devices and integrated circuits

We also signed reciprocal agreements on both undergraduate and graduate research exchanges with the following institutions:

- Institut supérieur de l'aéronautique et de l'espace (ISAE-SUPAERO, France) — includes four exchange spaces, signed April 2018
- Technical University of Denmark — includes five exchange spaces, signed February 2018

Global Engineering

Our Centre for Global Engineering (CGEN), established in 2009, encourages students to engage with global challenges in sanitation, alternative energy, health costs and clean water — especially in developing countries where solutions can have the greatest impact. CGEN provides courses at the undergraduate and graduate levels, facilitates international engineering projects and offers fellowships for research with global impact.

One of CGEN's flagship courses is *JCR1000Y: An Interdisciplinary Approach to Addressing Global Challenges,* which is open to students from U of T Engineering, the Munk School of Global Affairs, the Rotman School of Management and the Dalla Lana School of Public Health. This year, a team of students in the course travelled to India to meet with stakeholders and organizations related to a project on food security through a partnership with the Public Health Foundation of India.

With the support of the Dean's Strategic Fund (DSF), CGEN is expanding international partnerships into courses across all years and disciplines. Examples include:

- Ongoing work in the course *MIE 490: Capstone Design* to implement locally appropriate technologies, including a windmill and a passive water regulator, to improve crop irrigation in Pedro Arauz, Nicaragua. Partner organizations include Winds of Change and Seeds of Learning.
- Two further projects in *MIE 490: Capstone Design* based in Kenya, including developing a power system for a small, mobile classroom. World Vision is a partner on both projects.
- Potential future collaborations with Asheshi University in Ghana, ACF Canada in Guatemala and Global Medic in the Philippines.

CGEN is one of several institutes that have new homes in the Myhal Centre for Engineering Innovation & Entrepreneurship.

Selected International Education and Research Partnerships

U of T Engineering spinoff ModiFace acquired by French cosmetics giant L'Oreal

U of T Engineering spinoff company ModiFace has been acquired by the world's biggest cosmetics company — a move that could result in Toronto becoming a hub for "beauty tech" research. ModiFace uses augmented reality (AR) and artificial intelligence (AI) to build advanced facial visualization software for the beauty and medical industries. Professor Parham Aarabi (ECE) founded ModiFace 11 years ago after he realized his research into computer vision and facial tracking could be applied to the cosmetics industry, allowing people to see what they look like wearing different shades of makeup and other beauty products. In March, French company L'Oréal announced its purchase of ModiFace, demonstrating how important technology has become to the US$460-billion global cosmetics industry. Aarabi will remain ModiFace's CEO, and the company will continue to be based in Toronto after the deal is completed. Of the company's 70 employees, 60 have a connection to U of T. In 2017, ModiFace announced it was investing $4 million in new undergraduate and graduate internships, as well as support for U of T Engineering research. The company plans to tap the University's vast pool of engineering and computer science talent as it continues to grow under its new owner.

Engineering students experience cross-cultural design with international capstone course

In October 2017, Ashley McIlvena (MechE 1T7 + PEY) boarded a plane for her first-ever trip to China. Along with her teammates — Milan Yang, Alice Wolfe and Jelica Bornath (all MechE 1T7 + PEY) — McIlvena met with a team of engineering students from Beihang University in Beijing, with whom they had been collaborating for the last three months. They were among four teams totaling 16 students that participated in this year's international capstone course from the Department of Mechanical & Industrial Engineering. In addition to Beihang University, partner institutions include Shanghai Jiao Tong University and Tsinghua University. McIlvena and her collaborators designed a pod for a Hyperloop, a high-speed train operating in a tube from which air has been partially evacuated, enabling speeds of up to 1,200 kilometres per hour. After the trip to China, U of T hosted the partner teams in Toronto in February 2018, providing valuable experiences for students on both ends of the partnership.

U of T Engineering celebrates Global Engineering Week

On March 12–16, 2018, U of T Engineering celebrated Global Engineering Week. The event series was organized by alumnus Malik Ismail (EngSci 1T6 + PEY) in partnership with the Centre for Global Engineering (CGEN) and the U of T Engineering student chapter of Engineers Without Borders. It launched with a double-header guest lecture featuring Dan Frey, the Faculty Director for Research at MIT's D-Lab, and Paul Cadario (CivE 7T3), Distinguished Fellow in Global Innovation at U of T Engineering and the Munk School of Global Affairs. Throughout the week, professors in 16 classes — including Engineering Strategies & Practice, taken by all first-year students in the Core 8 disciplines — incorporated case studies about global engineering projects into their lesson plans. The week also included a case competition and wrapped up with a global engineering fair, where students could see examples of past projects facilitated by CGEN and ask questions of the students involved. Overall, the goal was to engage students inside and outside the classroom, and to raise awareness about challenges that transcend borders and the need to ensure that solutions are appropriate for the needs of local communities around the world.

Data-driven farming: U of T Engineering spinoff develops low-cost sensors for Nepal

An unassuming grey box about the size of a coffee mug could be the key to significant improvements in crop yields for farmers in Nepal and around the world. The device, developed by alumni Ahmed Mahmoud (MechE 1T1, MIE MASc 1T6) and Donn Pasiliao (MechE 1T1, MIE MASc 1T4) is attached to a metal probe that measures the moisture content of any soil into which it is inserted. This information is then made available online through an Internet of Things (IoT) controller or through radio frequency signals. Professor Amy Bilton (MIE) worked with Mahmoud and Pasiliao to propose the technology for the Data Driven Farming Prize, an international competition that seeks to create new tools for generating data and translating it into actionable information that can help farmers. The competition is sponsored by Feed the Future, a U.S. government initiative designed to combat global hunger and poverty, and the non-profit Challenge Prize Centre. In September 2017, the team earned a $50,000 runner-up prize in the competition, and used the money to develop a network of 30 devices, currently being piloted in Nepal via a trial conducted by the Mexico-based agricultural research organization CIMMYT and the Himalayan knowledge-sharing network ICIMOD.