## Overview

Ontario’s engineering graduates and researchers have a vital role to play in our society. They design the infrastructure that keeps people, goods and services moving, the networks that protect our data and privacy, and the mines that produce and extract critical minerals.

As the demand for engineers increases across the province, and as the province works to grow the economy, Ontario’s universities will continue to train the engineering workforce Ontario needs to fill in-demand jobs and conduct groundbreaking research across key sectors. These engineering professionals will be essential to building the road to the Ring of Fire, designing the electric vehicles of the future and bringing modern technologies to finance, ultimately helping fuel local workforces and create jobs in construction, information technology and more.

### Strong Demand for Engineering Talent

- STEM graduates are essential to Ontario’s economic prosperity, including the critical role of engineers.
- According to Stokes Economics, Ontario will need more engineers, software engineers and managers in engineering over the next 10 years.
- Students from Ontario university engineering programs are graduating job-ready and resilient with a more than **94%** employment rate, two years after graduation, according to the latest Ministry of Colleges and Universities Graduate Survey of 2018 graduates.

### Developing Ontario’s Engineering Talent Pipeline

- More and more students are enrolling in in-demand university engineering programs:
  - Ontario’s universities have increased enrolment in engineering and applied sciences programs by **65.6%** since 2010.
- Ontario’s universities offer a wide array of engineering programs that address industry needs. For example, as we seek new ways to build safe, cost-effective, and greener alternatives to traditional construction, the University of Waterloo is teaching the next generation of civil engineers about 3D computer vision based, easily deployable systems for inspection, prefabrication and modular assembly of constructed facilities, changing the way we look at housing and construction.
- Students continue to demonstrate interest in engineering programs at Ontario’s universities:
  - Recent data provided to COU from the Ontario Universities’ Applications Centre, indicates applications to Ontario university engineering programs has increased by **6.2%** compared to the previous year.

*The University Network of Excellence in Nuclear Engineering (UNENE), created through a partnership of three Ontario universities, offers nuclear engineering, science and technology research and education programming to support and advance excellence in nuclear science, technology and engineering.

*Toronto Hydro continues to partner with Ontario’s universities to provide students, both domestic and international, with work-integrated learning opportunities to help fill critical labour shortages and ensure students graduate job-ready in electrical engineering.*
PARTNERING TO BUILD A HIGHLY SKILLED ENGINEERING WORKFORCE

Success in today’s complex engineering and technology labour market requires technical skills, real-world relevance and career accelerating experiences. It requires the drive and insight to relate products and ventures to dynamic markets, and strategic opportunities.

Through innovative engineering programs, work-integrated learning (WIL) and continuing education opportunities, as well as ground-breaking research that touches all aspects of our society, Ontario’s universities continue to partner to train and build the engineering workforce the province needs to build a stronger Ontario.

Below are just some of the ways Ontario’s universities are meeting the growing demand for a highly skilled engineering workforce and undertaking innovative engineering research to solve critical provincial challenges that will help build better and safer communities across the province.

### Building a strong engineering talent pipeline through innovative programs

- **Ontario** will need engineers who can design in-demand sustainable and renewable energy infrastructure as the province works to reduce greenhouse gas emissions. The Sustainable and Renewable Energy Engineering program at [Carleton University](https://www.carleton.ca) is helping build Ontario’s green energy engineering workforce. By helping students develop the analytical and technical skills needed to design, build and operate sustainable energy systems, students graduate prepared to design the critical environmental infrastructure needed for clean energy generation, distribution and usage across the province.

- **Water resource engineers** will be all the more critical to Ontario’s engineering workforce as the province’s population and economy grows. The Water Resource Engineering program at the [University of Guelph](https://www.uoguelph.ca) is helping engineering students develop the skills needed to design and identify solutions that protect urban and rural groundwater, soil, wetlands, streams and lakes. The program combines civil and environmental engineering, agriculture, planning and geography to prepare students to address society’s most pressing water concerns and needs.

- **Today’s engineers** need to be equipped with a diverse technical skillset to address society’s most complex challenges – from clean technology to health care. The Integrated Engineering program at [Western University](https://www.uwo.ca) is equipping students with a strong foundation in innovation and leadership across engineering disciplines with an optional dual degree in business or the humanities. Through this approach, students graduate ready to fill technological innovation gaps across traditional and untraditional engineering professions, such as finance and law.

### Driving entrepreneurship and providing hands-on experiences for tomorrow’s engineers

- **Skilled entrepreneurs** are critical to fueling Ontario’s innovation ecosystem and tackling complex modern industrial, societal and environmental engineering challenges. [McMaster University](https://www.mcmaster.ca)’s new engineering undergraduate curriculum includes design thinking, innovation and entrepreneurship at all levels. From year one, students participate in the first-of-its kind Integrated Cornerstone Design Projects in Engineering course, working with industry to solve real-world challenges. With an entrepreneurial skill set, students are positioned to create R&D solutions that advance society and identify strategic opportunities in high-potential markets.

- **The Climate Positive Energy (CPE) Initiative** is the University of Toronto’s hub for clean energy research and training across all campuses. CPE engages more than 300 student and faculty members in multidisciplinary collaborative research, industry partnerships, and career-building workshops to tackle the climate challenge from both technical and social perspectives. Through scholarships and other funding from CPE, U of T students are developing energy efficiency strategies and technologies for topics like building retrofits, emissions accounting and measurements, and impact assessments of policies on consumer behaviour and the just and equitable transition to a clean energy future.

- **Ontario** will need skilled entrepreneurs to drive technology-based solutions in key industries, such as health care and manufacturing. To help engineering students develop their entrepreneurship skills and drive innovation, the [University of Waterloo](https://www.uwaterloo.ca) launched the Enterprise Co-op (E Co-op) program. Through E Co-op, students can choose to start their own business while pursuing a co-op credit. Students also have access to a network of mentors, entrepreneurs and practical workshops and seminars to help them launch their Ontario-made product or service.
PARTNERING TO BUILD A HIGHLY SKILLED ENGINEERING WORKFORCE

Ontario’s engineering workforce needs the best practices in critical ground support design as operations expand. As mines go deeper and get larger, today’s mining engineers need to be equipped with the skills to design for complex mining operations that support the safety of people and infrastructure. Laurentian University launched an interactive professional development workshop and short course through MIRARCO Mining Innovation and the Goodman School of Mines to help Ontario’s mining engineering workforce learn best practices in critical ground support design as operations expand.

To help engineering graduate students, recent alumni and fellows develop their entrepreneurial skillset and commercialize their Ontario-made products and services, Queen’s University is partnering with Mitacs on the Invention to Innovation (i2i) skills training program. The program aims to help engineering students and graduates take their ideas from lab to market by introducing them to the commercialization lifecycle, such as patents and intellectual property.

Project management and communication have become vital skills needed by engineers across sectors. To help early-to mid-career engineers develop a strong foundation in project management communications, York University launched the Schulich–Lassonde Certificate in Project Management for Engineers. The goal of the course is to help engineers develop the knowledge and skills they need to ensure small and large-scale projects are delivered on time, on budget and in-line with stakeholder expectations.

Ontario Tech University is partnering with Mitacs on the Invention to Innovation (i2i) skills training program. The program aims to help engineering students and graduates take their ideas from lab to market by introducing them to the commercialization lifecycle, such as patents and intellectual property.

Leading ground-breaking engineering research across key sectors

As more municipalities look to mass timber as a low-carbon alternative to existing building materials, finding innovative solutions that protect residents from a potential fire is critical. To help address this challenge, engineering researchers at Lakehead University have developed and tested an innovative mass timber connector that can resist fire for one hour without added protection. The innovation has since received a patent certificate from Innovation, Science and Economic Development Canada.

As the demand for electric vehicles (EVs) grows, automotive companies will need to ensure their vehicles are suitable for a range of climates and weather patterns. Researchers at Ontario Tech University are working with industry to support product development, research and testing to ensure the safety of EVs across different climates. The university is leveraging its world-class automotive testing facilities – the Climatic Aerodynamic Wind Tunnel and Moving Ground Plane – to test the safety of EVs and provide insight into suitable designs for extreme weather conditions.

To help make high-speed quantum computers even more powerful, engineering researchers at the University of Ottawa are partnering with Toronto-based technology company Xanadu to develop and commercialize high-powered quantum computing technology, such as algorithms. Research like this, along with multidisciplinary technology hubs, such as the university’s Smart Connected Vehicles Innovation Centre, will have far-reaching implications across Ontario’s industries.

At Toronto Metropolitan University, PhD students under the supervision of Dr. Bilal Farooq, have been conducting research to assess the impact of electric vehicles (EV) on the environment with a focus on reducing greenhouse gas (GHG) and nitrogen oxide emissions. In one study, students employed traffic and emissions modelling to determine the impact of EVs on urban road networks. In another study, students assessed the GHG emissions generated from the mining procedures and supply chain required to manufacture and transport EV batteries. From this collective research, TMU students have been able to contribute to new ideas around policies, technologies and manufacturing processes to mitigate the harmful emissions created throughout the EV lifecycle.

As Ontario builds an end-to-end electric vehicle (EV) supply chain across the province, innovative EV research will help further position Ontario as an industry leader. The Centre for Hybrid Automotive Research and Green Energy (CHARGE) Lab at the University of Windsor is conducting ground-breaking EV research with a focus on five key research areas: design, testing, drives and control, charging and simulation and testing. Through this research, CHARGE is promoting collaboration, creativity and practical implementation to enhance the EV research landscape across the province.

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