

WATERLOO | ENGINEERING

STRATEGIC PLAN

THE EPICENTRE OF TECHNOLOGY TALENT

2020-2025

WATERLOO
ENGINEERING



UNIVERSITY OF
WATERLOO



VISION

Waterloo Engineering will inspire leaders to define new frontiers. Upholding our tradition of co-operative education, we will continue to stimulate our entrepreneurial spirit and research imagination. Above all, our engineers and architects are committed to serving society, and building a better future for generations to come.

DEAN'S MESSAGE

Technology plays a profound role in our global community. As Waterloo engineers and architects, we are cognizant of the tremendous responsibility we have to ideate, create, understand, and use our knowledge to better the welfare of humanity while protecting and sustaining our planet.



PEARL SULLIVAN

DEAN, FACULTY OF ENGINEERING
UNIVERSITY OF WATERLOO

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As engineering and design educators, researchers, leaders and global citizens, we are shaping the future of society. The decisions we make today will impact millions, perhaps even billions, of people worldwide.

It is a time of flux as work is being transformed – yet again – by the massive influence of new technologies such as artificial intelligence, advanced robotics, and new global labour markets. As educators, we know our role is to ensure that our students and employees have the opportunity to achieve their highest potential and that this talent is developed and deployed to the maximum benefit of society. We now exist in a world where individual knowledge and skills must continuously grow and the changing nature of work demands that higher education fits seamlessly and collaboratively with business, industry, government, and society. It is a formidable challenge, but one we are enthusiastically and thoughtfully undertaking. In many respects, it is a continuation of our philosophy – that co-operative education is the ideal method to educate engineers. Because of this, the Faculty of Engineering has a six-decade head start on collaborative education-work integration. We've been shaping the future of engineering education and innovation since we were the founding Faculty of the University of Waterloo in 1957.

As we implement our third formal Strategic Plan, it is important to note that we have achieved almost all of our goals set out in our previous plan. We launched our Biomedical Engineering and Architectural Engineering programs. We expanded Mechatronics Engineering. We enhanced the student experience through novel learning methods such as our Engineering Ideas Clinic® and added much-needed space for studying and labs. We built Engineering 7, which is now the “front door” of Waterloo Engineering and has allowed us to help meet the global demand for educating more Waterloo engineers.

With this new Strategic Plan 2020-2025, we are tackling five key priorities as identified through extensive and open consultation Faculty-wide. In our quest to be the epicentre of the world's technology talent, we are driving the momentum that already exists to ensure we are empowering our students, researchers, and staff to unlock potential and create positive change.

We are facing the future with optimism and clarity with the full understanding that what we do here at the Faculty of Engineering will help to build a new foundation for the future of learning, work, design, and technology.

EXECUTIVE SUMMARY

THE EPICENTRE OF TECHNOLOGY TALENT

From breaking open new frontiers of research that will transform lives and industry, to redefining the educational experience for undergraduate and graduate students, the Faculty of Engineering is determined to be the destination of choice for students and researchers while continuing to be the engine of innovation and entrepreneurship for our nation.

The Faculty of Engineering is renowned for uniquely preparing engineers and architects to tackle the hard problems facing humanity. Yet being Canada's premier engineering and entrepreneurship school is not enough. We are committed to going beyond the expected to achieve the extraordinary.



The Strategic Plan 2020-2025 focuses on five priorities that will determine the direction and ongoing success of the Faculty of Engineering at the University of Waterloo for the next five years. As Canada's largest engineering school and ranked in the top 50 worldwide, the Faculty of Engineering continues to offer undergraduate and graduate students the most robust, unique, and experiential education anywhere in the world and is fearless in its pursuit of research excellence in emerging technologies. This Strategic Plan 2020-2025 is based upon our vision (inside front cover) which will inspire leaders to define new frontiers in education, entrepreneurship and research to better serve society.

OUR STRATEGIC PRIORITIES AND ASPIRATIONS

The five key strategic priorities and their corresponding aspirations that form the foundation of Strategic Plan 2020–2025 are:



Undergraduate Learning: Experience

Offer the single best engineering and design education experience in Canada.

Graduate Learning: Work-Integrated

Become the world leader in work-integrated graduate studies in engineering and architecture.

Research: From Imagination to Impact

Become unmatched in bringing transformation from the lab to the world.

Operations and Resources: Enable

Foster a collaborative culture of wellbeing, empowerment, and sustainability.

Reputation and Outreach: Connect

Become the epicentre of the world's technology talent.

THIS STRATEGIC PLAN 2020–2025 REPORT IS AN OVERVIEW OF WATERLOO ENGINEERING'S STRATEGY.

THE DETAILED TACTICS OF HOW EACH DEPARTMENT WILL ACCOMPLISH THESE STRATEGIC

ASPIRATIONS AND GOALS WILL BE PUBLISHED IN A FULL REPORT THAT WILL BE LOCATED AT

uwaterloo.ca/engineering-strategic-plan-reporting AND REQUIRES AN AUTHORIZED LOGIN.

PRIORITY

UNDERGRADUATE LEARNING: EXPERIENCE



The Faculty of Engineering uniquely prepares our students to solve society's most difficult problems. Renowned for our rigorous engineering academic curriculum and our co-operative education program, we attract the best and the brightest students from across Canada and beyond.

continue to focus on building a solid foundation of success that will support them throughout the increasingly challenging upper years. Leading new initiatives to promote excellence in teaching and offering unique learning experience, we will help our students continue their love and passion for their engineering and design studies.

Educational deep learning means knowledge becomes intrinsic to our thinking. We will find new ways to encourage and inspire our students to learn and think in new ways. With additional integrative and reflective learning approaches, our students will be able to connect ideas and concepts across courses and curriculum for a holistic understanding of the challenges an engineer faces. We will continue to emphasize a personalized learning environment that allows our students to explore areas in emerging technologies and specialized knowledge that is most interesting to them – an engaged and excited student is a successful student. Our strong entrepreneurial ecosystem will grow and continue to support those students who wish to explore new ventures at any stage of their academic career. We do all this through the lens of diversity and global perspectives, encouraging our students to explore the world through international co-op opportunities and exchange programs.

Each fall, more than 1,800 students begin their studies in one of our engineering or architecture programs. With more than 8,000 full-time undergraduate students in the Faculty, we strive to continually improve in all areas of our undergraduate experience to ensure students have a consistently enriching educational journey.

To achieve this superior experience, we always begin from the moment students accept their offer. We will



ASPIRATION

Offer the single best engineering and design education experience in Canada.

GOALS

- > ESTABLISH A FOUNDATION FOR SUCCESS THROUGH FIRST YEAR ENGAGEMENT AND TEACHING EXCELLENCE IN INTRODUCTORY COURSES
- > ADVANCE THE CO-OP EXPERIENCE
- > PROVIDE A CONSISTENT LEARNING EXPERIENCE ACROSS THE FACULTY BY STANDARDIZING STUDENT WORKLOAD AND RAISING TEACHING QUALITY
- > LEAD BEST PRACTICES IN ASSESSMENT METHODS
- > INCREASE PERSONALIZED, REFLECTIVE, AND INTEGRATIVE LEARNING THROUGH THE CURRICULUM AND TEACHING
- > BROADEN STUDENTS' GLOBAL PERSPECTIVE AND PROFESSIONAL SKILLS

25+

STUDENT DESIGN
COMPETITION
TEAMS

9,121

CO-OP PLACEMENTS

4,500

ENGINEERING
EMPLOYERS

2,461

FEMALE STUDENTS
ENROLLED



4th YEAR

Architecture Students
study abroad in Rome

#1

in Canada for most
venture-capital-backed
entrepreneurs
(Pitchbook Ranking 2019)

All data listed is from 2018-19

UNDERGRADUATE PROGRAMS

Architecture, Architectural Engineering, Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Environmental Engineering, Geological Engineering, Management Engineering, Mechanical Engineering, Mechatronics Engineering, Nanotechnology Engineering, Software Engineering, Systems Design Engineering

PRIORITY

GRADUATE LEARNING: WORK- INTEGRATED

As the economic demand for professionals with specialized knowledge, training, and skills continues to climb, the University of Waterloo's Faculty of Engineering plays a key role in developing our talent pipeline. Our Master's and PhD programs are vital to advancing innovation and fueling our nation's economic engine.

talent here as graduate students. This will allow our graduate students to deepen and specialize their knowledge – allowing them to be more able to solve the difficult challenges facing industry and beyond. We will also intensify recruiting graduate students by promoting our Waterloo Engineering education that offers active networking with industry and international experiences. As Canada's most innovative post-secondary institution, which is known for ground-breaking research as well as our renowned startup ecosystem, we have much to offer graduate students.

Going forward, we are focusing on improving the graduate students' experience from their first day on campus and throughout their academic journey. We will enhance the graduate student educational experience by offering a curated selection of specialized, outstanding courses. We will continue to update our curriculum and programs to ensure students are receiving materials at the forefront of knowledge. We will strive to offer an engaging experience for graduate students through relevant and exciting research opportunities and we will celebrate their research achievements. We will provide training and resources to faculty members to enable them to be the best supervisors they can be. We want our graduate student alumni to be extremely satisfied with their career-enhancing educational experience at Waterloo.



We understand that our graduate programs have the power to change the trajectory of lives both here and abroad so we prepare students for their future regardless of the path they choose – industry, academia, or entrepreneurship (or combined).

With this knowledge, we will use these next five years to create a world-renowned work-integrated learning program. We will not only attract the best undergraduate students to our Faculty but will also keep this top

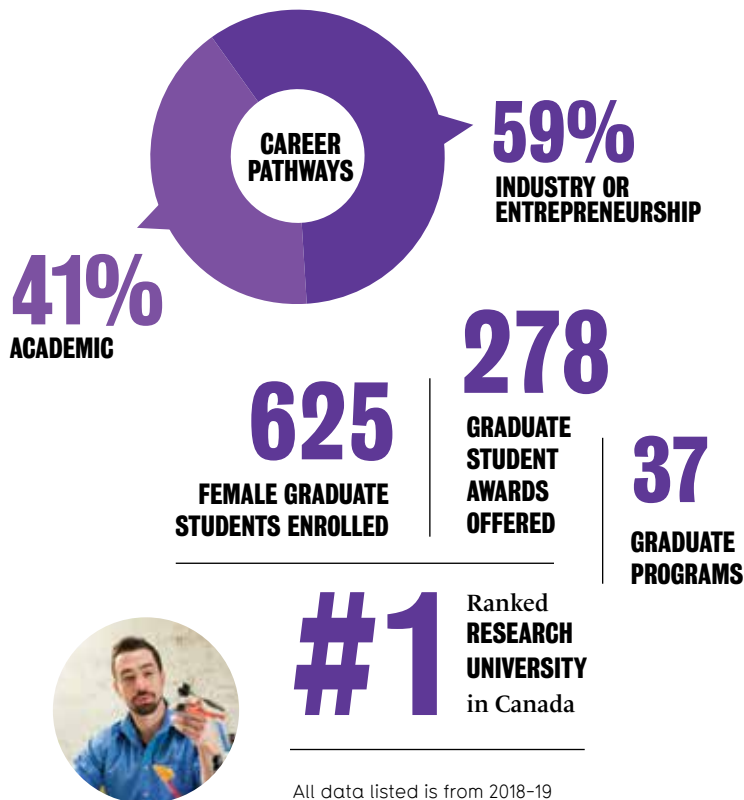


ASPIRATION

Become the world leader in work-integrated graduate studies in engineering and architecture.

GOALS

- > RECRUIT AND RETAIN TOP TALENT FROM ACROSS CANADA AND THE WORLD
- > OFFER A CURATED SELECTION OF EXCEPTIONAL COURSES AND PROGRAMS
- > PROVIDE A PERSONALIZED EDUCATIONAL EXPERIENCE INSPIRING LEARNERS TO DEVELOP SOLUTIONS TO COMPLEX PROBLEMS
- > INTENTIONALLY DESIGN CAREER INTEGRATION OPPORTUNITIES
- > ENABLE OUR FACULTY TO BE INSPIRING SUPERVISORS, EXCELLENT TEACHERS, AND SUPPORTIVE MENTORS
- > COMPREHENSIVELY IMPROVE GRADUATE STUDENT EXPERIENCE



All data listed is from 2018-19

PRIORITY

RESEARCH: FROM IMAGINATION TO IMPACT



From the imagination of the researcher to the impact on society, the research that is undertaken at the Faculty of Engineering has global significance. Research funding has increased by over 50 per cent in the last five years because of our robust research environment, including our exceptional faculty and world-class research laboratories. We will use these next five years to further strengthen our research capacity and expertise.

We will begin with more intensive support for our researchers. To inspire research leadership, we will empower our people to engage and grow our research community while continuing to attract and retain top talent. It is critical that we expand our support to new hires and early career researchers and help them build momentum. We will do this through additional infrastructure support as well as creating opportunities to network with our already established researchers. For those with entrepreneurial aspirations, we will provide increased mentorship and help them catalyze commercialization, which allows their research to become an essential component of economic innovation.

Growing our research funding further is also key to our Strategy 2020-2025 vision. Excellent research requires the funding to support more than just equipment and laboratories. We need to ensure we retain, attract, and support top talent and provide opportunities for growth and collaboration. We will continue to focus on faculty renewal by strategically hiring top-calibre individuals with expertise that complements the existing strong research talent in the Faculty of Engineering as we continue to pursue cutting-edge, emerging research in areas of global significance. We will seek out the opportunities that allow our researchers to tackle the truly difficult problems of our world.



ASPIRATION

Become unmatched in bringing transformation from the lab to the world.

GOALS

- > GROW RESEARCH FUNDING BY STRENGTHENING TIES WITH THE PRIVATE, NONPROFIT, AND PUBLIC SECTORS
- > EXPAND SUPPORT FOR NEW HIRES AND EARLY CAREER RESEARCHERS IN BUILDING MOMENTUM WITHIN THEIR PROFESSIONS
- > INTENSIFY AND DIVERSIFY GLOBAL RESEARCH OPPORTUNITIES
- > FACILITATE KNOWLEDGE SHARING AND COLLABORATION
- > EMPOWER OUR FACULTY MEMBERS TO PURSUE IMPACTFUL RESEARCH THAT SOLVES COMPLEX PROBLEMS OF GLOBAL SIGNIFICANCE
- > CATALYZE AND SUPPORT RESEARCH COMMERCIALIZATION FOR STUDENTS AND FACULTY
- > ENABLE RESEARCH LEADERS TO GROW OUR RESEARCH COMMUNITY AND ATTRACT AND RETAIN EXCELLENT TALENT

- > Water Resources
- > Sustainability and Renewable Energy Systems
- > Smart and Adaptive Infrastructure

9 SIGNATURE RESEARCH CLUSTERS

- > Additive and Advanced Manufacturing
- > Automotive and Mobility
- > Connectivity, Network Communications, and Security

- > Data Analytics, Artificial Intelligence, and Human-Machine Interaction
- > Robotics and Autonomous Systems
- > Bio-Engineering and Health

\$96M

SPONSORED RESEARCH FUNDS

110

AUTOMOTIVE RESEARCHERS

Most in Canada



LARGEST

AUTOMOTIVE RESEARCH PROGRAM IN THE COUNTRY

YOUR WORK YOUR PROPERTY

100%

of the ideas developed at Waterloo are owned by their creators

\$25 MILLION IN NSERC AWARDS

All data listed is from 2018-19

PRIORITY

OPERATIONS AND RESOURCES: ENABLE

We face increasingly complex challenges in our workplace that require deep and ongoing collaboration. To thrive in this dynamic work environment, we recognize that diversity and inclusion must form the bedrock of our Strategy 2020–2025. It is these attributes which differentiate a good community from a truly outstanding culture that can raise the standards of operations and services.

To achieve this inclusiveness, we will evaluate the environment created through our policies and procedures and hold them up to a standard of improved wellbeing for all who are part of the Faculty of Engineering. We will increase connections and engagement with our people so everyone knows they are valued and understand the value of their contributions. We will establish an expert panel to develop an employee engagement action plan. The panel will propose recommendations to ensure that we continue to foster our innovative, dynamic workplace culture.



The Faculty of Engineering values and embraces diverse backgrounds and the ideas, experiences, and viewpoints of our people because we know that the world's most challenging problems require novel and multiple perspectives. We need great minds with a wide variety of viewpoints working on these problems to ensure our solutions benefit all.

We will continue to build and nurture an inclusive community where everyone feels they belong and are able to contribute – our students, employees and members of the wider Faculty of Engineering community – because we all matter in our ongoing success.



ASPIRATION

Foster a collaborative culture of wellbeing, empowerment, and sustainability.

GOALS

- > BE AN INCLUSIVE COMMUNITY WHERE EVERYONE FEELS THEY BELONG
- > INTEGRATE WELLBEING THROUGHOUT POLICIES AND PRACTICES
- > GATHER AND MOBILIZE ORGANIZATIONAL DATA TO FACILITATE EVIDENCE-BASED DECISION MAKING
- > MAXIMIZE THE UTILITY OF SPACE AND FINANCIAL RESOURCES
- > GROW EMPLOYEE ENGAGEMENT WHILE MANAGING AN APPROPRIATE COMPLEMENT OF FACULTY AND STAFF
- > PROVIDE WORLD-CLASS COMPUTING SOLUTIONS TO IGNITE RESEARCH AND STREAMLINE TECHNOLOGICAL SYSTEMS

We also know we cannot achieve our ambitious strategic plan without effective operational systems and resources. We will invest in computing system infrastructure that is required for complex research discoveries. Student enrolment has grown by 33 per cent in the last decade, therefore we must optimize our limited resources to provide excellent service. We will leverage technological solutions and streamline administrative functions to ensure responsive and timely service to our students. Maximizing use of space and aligning our budget projections to our strategy are also fundamental to success. Critically, we will continue to use data to make evidence-based decisions and, with open, curious minds, we will seek answers and ask new questions.

LARGEST
STUDENT DESIGN CENTRE
in North America



155+
RESEARCH LABS

348 FACULTY MEMBERS

ONLY
ENGINEERING FACULTY WITH A BUSINESS SCHOOL
in North America

All data listed is from 2018-19

PRIORITY

REPUTATION AND OUTREACH: CONNECT

The Faculty of Engineering occupies a singular space in the world of technology and innovation in North America because of our unique co-operative education program, entrepreneurship ecosystem, and our strong partnerships with industry.

talent at all levels. Our model will be extended to graduate levels - from first-year master's to final-year doctoral programs - our graduate studies will be fully experiential and integrated with the external world. Our fundamental research will be known for major breakthroughs and our translational research will have a lasting impact on humanity.

In 2020, we will launch the next wave of education and research that will produce exceptional, highly skilled talent who will be ready to shape technology in a fast-paced world for the benefit of humanity – and we must share this message worldwide.

To build this momentum, we will undertake specific campaigns and strategies to ensure our research accomplishments are widely disseminated across the University and throughout the world. We will showcase our talent and expertise by hosting international conferences and bringing other leading researchers to our state-of-the-art facilities. We will also work to better communicate the differentiation between engineering disciplines and make it easier to discover the expertise that is found within the Faculty. We will deepen our engagement with all our stakeholders – alumni, staff, faculty, industry, friends, government, and media – to ensure they feel connected and are aware of the world-changing talent and research that originate from the Faculty of Engineering.





ASPIRATION

Become the epicentre of the world's technology talent.

GOALS

- > ELEVATE OUR INTERNATIONAL RESEARCH PROFILE
- > IMPROVE UNIVERSAL UNDERSTANDING OF DISCIPLINES WITHIN THE FACULTY OF ENGINEERING AND BEYOND
- > COMMIT TO DIVERSITY AND EQUITY THROUGHOUT OUR PROGRAMS, POLICIES, AND PROCESSES
- > BUILD MOMENTUM, ANTICIPATION, AND EXCITEMENT AROUND THE FACULTY OF ENGINEERING
- > ENHANCE COMMUNICATION AND DEEPEN ENGAGEMENT WITH ALL STAKEHOLDERS

Our talent must also be reflective of the world we live in so we are committed to diversity and equity through increased support for our Engineering Outreach programs, specifically for under-represented communities. To attract and retain top talent, we are integrating equity and diversity throughout our policies and procedures to ensure the Faculty of Engineering is their first choice among top schools.

\$100M

PHILANTHROPIC SUPPORT

received as part of the *Educating the Engineer of the Future* campaign

46,541

ALUMNI as of 2018/19

18

OUTREACH PROGRAMS

700

STARTUPS, SPIN-OFFS AND MATURE COMPANIES

have Waterloo Engineering students, faculty, staff, or alumni as founders



TOP 50

Engineering school in the world (QS World University Ranking 2019)

THE PROCESS BEHIND THE STRATEGIC PLAN

In fall 2017, the Engineering Planning Committee (EPC) began the strategic planning process by considering the value proposition, competitive advantages, and key activities of the Faculty of Engineering. During these in-depth discussions, strategic priorities were determined and our Academic and Administrative units launched their individual self-study processes.

This self-study process was the opportunity to comprehensively reflect on their unit's performance measured against the previous strategic plan as well as considering their unit's strengths and weaknesses. Each unit was then asked to strike a planning committee that was required to include faculty, staff, and students. Each of these committees was given the freedom to implement the self-study process in a way that made the most sense for their unit; this included workshops, subcommittees, and surveys. Once finalized, each self-study document was presented to the EPC – allowing for full knowledge sharing across the Faculty.

Simultaneously, the Faculty of Engineering undertook a

broad student survey with undergraduate and graduate students surveyed separately. Survey questions were developed in consultation with the Waterloo Engineering Society (ENGSOC), Waterloo Architecture Student Association (WASA), Society of Waterloo Architecture Graduates (SWAG) and every Graduate Student Association (GSA) president. In all, 1,275 undergraduate students and 418 graduate students responded to the survey, representing a 16.3 per cent and 20 per cent response rate respectively. The data from the student surveys was analyzed extensively and referenced throughout the self-study submissions.



Following the self-study process, EPC revisited the vision and aspiration statements – ensuring the consultations were accurately reflected in the final version. The vision and aspirations statements guided the development of the goals. With the finalized direction, the units were once again asked to work within their planning committees to develop goals for their individual areas. The goal submission documents were collated and synthesized at the Faculty level to determine commonalities and

consistent themes. It was through this process that the Faculty-level goals were developed. The Faculty’s Director of Planning met with each Director, Chair, and Associate Dean to describe how their goals strengthened the Faculty goals. This ensured clarity, consensus, and understanding for everyone involved.

On July 19, 2019, the Faculty-level goals were approved and are presented here in the Faculty of Engineering Strategic Plan 2020-2025.

THE EPC MEMBERSHIP CAN BE FOUND AT uwaterloo.ca/engineering/about/strategic-planning

NEXT STEPS

Going forward, Academic and Administrative Units will continue to develop their individual strategic and implementation plans, including data targets and outcomes for the next five years. Once finalized, the detailed Academic Plan will be available to Faculty of Engineering students, faculty, and staff.

On an annual basis, the Associate Deans, Chairs, and Directors will report against the Academic Plan. The results of the report will be reviewed and monitored by the Dean of Engineering and EPC.

The Academic Report will be accessible online for all Faculty of Engineering students, faculty, and staff.

The Director of Planning will use the information from the Academic Report to report against the Faculty Goals, presented here in the Faculty of Engineering Strategic Plan 2020-2025.

INTEGRATION WITH UNIVERSITY OF WATERLOO STRATEGIC PLAN

The Faculty of Engineering developed its strategic plan in parallel to the University of Waterloo's strategic plan. Both plans are intended to direct activities for 2020-2025. Throughout the development process, the Dean facilitated knowledge sharing both from the Faculty to the University of Waterloo administration and from the University of Waterloo administration to the Faculty, thus ensuring integration and collaboration throughout the planning process. The Faculty of Engineering will continue to engage in the implementation of the University of Waterloo's strategic plan.







ADDITIONAL RESOURCES

UNIVERSITY OF WATERLOO STRATEGIC PLAN

uwaterloo.ca/strategic-plan

FACULTY OF ENGINEERING STRATEGIC PLAN

uwaterloo.ca/engineering/about/strategic-planning

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WATERLOO | ENGINEERING

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