



**SMITH
ENGINEERING**
Queen's University

DRIVING CURIOSITY FORWARD





VISION

Engineering Leaders to Meet Global Challenges.

MISSION

We combine curiosity-driven, high-impact research with creatively inspired, technically rigorous, and experientially linked engineering programs to contribute substantively to current and future challenges that face our world.

RETHINKING ENGINEERING EDUCATION

Engineering education is ready for its next leap forward.

Smith is ready to lead the way.

The Stephen J.R. Smith Faculty of Engineering and Applied Science at Queen's University is poised to establish a more humanistic approach to engineering that ensures our students are prepared to meet the challenges that face our world; understanding and reflecting on engineering's impact on people and how they live, as well as our natural environment and resources.

We will be a global leader in ensuring all students, regardless of gender, ethnicity, race and sexual orientation, are supported and prepared for the future.

We will attract and encourage creative problem-solvers, potential inventors, entrepreneurs and out-of-the-box thinkers. Innovative research and education that aligns with the grand challenges of today will empower our graduates to seize the opportunities of tomorrow.



Engineering's Challenge

Engineering education needs to change.

This was the declaration of Engineering Deans Canada in 2019; a consideration borne of the globalization of economy and trade, the complexities of global grand challenges, the accelerating pace of technology and growing public demands for technological accountability.

Engineers are uniquely qualified to lead the world through the next century, through analytical thinking and intuitive problem-solving. Their scope of thinking must incorporate perspectives from beyond engineering, applying key insights from the humanities to solve the human problems we face.

Engineering graduates must be equipped to adapt to a rapidly changing scope of practice – a radical evolution of not only what we teach, but how we teach it.

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Are we expecting our students to solve types of problems that inspire them to continue to pursue a career in engineering and change the world for the better?

Sheryl Sorby, Norman L. Fortenberry, Gary Bertoline; “Stuck in 1955, Engineering Education Needs a Revolution”, *Issues in Science and Technology*



Our Response

Smith Engineering will lead this transformation in engineering education through significant and deliberate changes that address three areas that challenge engineering educators around the globe:

- **We will intensify research impact** and develop solutions to the grand challenges facing the world.
- **We will push the frontiers of education** toward a more humanistic approach to engineering that addresses today's digital, diverse, global and rapidly changing society.
- **We will foster a diverse and inclusive community**, ensuring the creation and support of a diverse talent base amongst students, staff, and faculty.

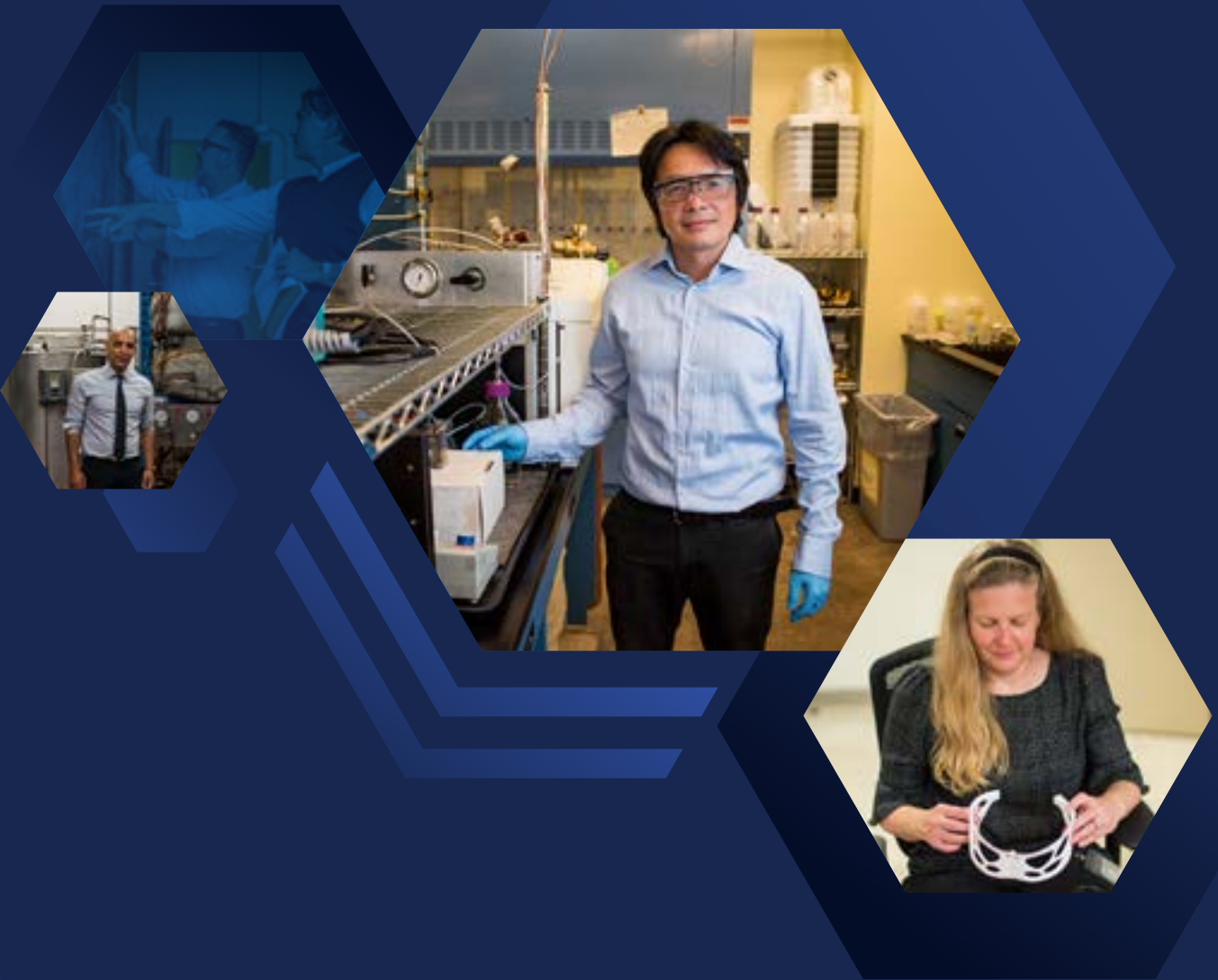
Smith Engineering is positioned to lead, thanks to our prestigious past and status as a Canadian trailblazer in engineering education and interdisciplinary learning. Our students are among the nation's best, backed by dedicated and remarkably accomplished alumni.



Research: From Curiosity to Impact

The Forefront of Engineering Education

Engineering for Everyone



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Research: From Curiosity to Impact

Research: From Curiosity to Impact

Smith Engineering will build on a trajectory of success – a 50% increase in research funding, and the hiring of 30 new faculty members over the past four years – with dramatic improvements to our human and physical capital.

We will increase our faculty complement and recruit graduate students in areas of strength and impact such as energy research, sustainability, resilient infrastructure, climate change, biomedical technologies and intelligent systems.

Multidisciplinary collaboration will strengthen and grow our research clusters. We will support our early-career researchers with mentorship, networking, and funding to accelerate their research careers.

Smith Engineering will ensure that outstanding research is valued, recognized and visible. Our research environment will provide the physical infrastructure, tools, training and support necessary for our students and faculty to reach their full potential.



OBJECTIVE 1

Increase research capacity

- SA 1.1** Increase the number of faculty members by 30% by the year 2026, through the creation of endowed chairs for teaching and research.
- SA 1.2** Grow the number of graduate students by 50% by the year 2026.
- SA 1.3** Compete for graduate students by committing to being in the top five universities nationally for financial support of both international and domestic doctoral students.
- SA 1.4** Develop new research infrastructure, core facilities and equipment.
- SA 1.5** Grow research funding by strengthening our partnerships with private, non-profit, and public sectors.



OBJECTIVE 2

Support research excellence

- SA 2.1** Develop research clusters in areas of international leadership and prestige such as sustainability, resilient infrastructure, climate change, biomedical technologies and intelligent systems.
- SA 2.2** Ensure early-career faculty members receive intensive support including mentoring and networking opportunities to help them build momentum and accelerate research impact.
- SA 2.3** Ensure graduate students have appropriate support including professional development opportunities, space and opportunities to build community.
- SA 2.4** Develop mechanisms to support cross-disciplinary interactions and collaborations within and outside Smith Engineering, including those to support international collaboration and mobility of scholars.

OBJECTIVE 3

Increase research visibility in Canada and beyond

- SA 3.1** Enhance our global ranking through international collaborations.
- SA 3.2** Develop and deploy marketing campaigns to communicate and showcase Smith Engineering research and its impact on the world to broader communities. Expand our media outreach to celebrate our status as a recognized leader in research.
- SA 3.3** Develop a new marketing campaign targeting excellent graduate students across Canada, communicating broadly about any new doctoral and post-doctoral scholarships at Smith Engineering.



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The Forefront of Engineering Education

The Forefront of Engineering Education

Smith Engineering will ensure that our curriculum prepares students to tackle crucial issues from urban development and land usage, to providing healthcare to remote populations, to mitigating climate change. Our curriculum will be transformed, as will our learning environments, with new learning spaces that emphasize multidisciplinary design and experiential learning environments where creativity and hands-on exploration transform creative thought into practical design.

Our students will be trained to tackle society's grand challenges – broad, integrative problems of deep societal importance where solutions are imaginable but the path to solutions is unclear. Aligned with the United Nations' Sustainable Development Goals, these challenges are human challenges: they will inspire and encourage multidisciplinary perspectives from the social sciences and humanities.

Interdisciplinary views of education are essential, as global reviews of engineering education identify silos among disciplines as a major challenge that constrains the development of engineering education.

Smith Engineering will foster its Engineering Teaching and Learning Team (ETLT) to support faculty in the development of an interdisciplinary, relevant and future-focused curriculum.

We will reinvest in and enhance our distinctive and successful philosophy that champions career readiness. Our 12–16 month paid internship program offers students the opportunity to gain valuable work experience, with almost 50% of our current fourth-year class out on internships and the program growing by double digits year over year. We will not cease these efforts until every Smith Engineering student has the benefit of relevant internships, job experiences and experiential leadership opportunities during their education.



OBJECTIVE 4

Commit to curiosity-driven and challenge-based education

- SA 4.1** Provide course scenarios that introduce students to SDG-aligned grand challenges that engineers can help solve and ensure they are given the space to experiment through trial and error when working on these issues.
- SA 4.2** Develop more connections between undergraduate study and research.
- SA 4.3** Identify key social challenges in the local community, Ontario, Canada, and/or around the world that students and the community can work on collaboratively.
- SA 4.4** Connect both undergraduate and graduate students to entrepreneurial opportunities.



OBJECTIVE 5

Enhance interdisciplinary learning

- SA 5.1** Investigate the feasibility of an integrated engineering program for students who are interested in a more general and multi-disciplinary curriculum experience.
- SA 5.2** Investigate and decide on a new interdisciplinary undergraduate program in Biomedical Engineering.
- SA 5.3** Identify and design integrative course “threads” that provide students with a curated list of courses across disciplines that tackle a common theme, such as addressing a UN SDG.
- SA 5.4** Integrate data science across our programs, ensuring students learn key skills with multidisciplinary impact as part of their full curriculum.
- SA 5.5** Commit to reviewing upper-year electives, with the objective of reducing barriers such as pre-requisites, establishing bridging courses that facilitate an overall increase in cross-listed courses that students in different disciplines can take, and offering courses jointly by faculty in different departments.
- SA 5.6** Expand opportunities to have students take courses outside of Engineering as a core part of their Engineering education, ensuring they are exposed to a breadth of thinking that incorporates ethical, economic and aesthetic values. We will jointly develop courses with other Faculties in areas that speak to global challenges and the UN SDGs.



OBJECTIVE 6

Expand professional experience options

- SA 6.1** Attain 100% undergraduate participation in research or industry internships, or other meaningful hands-on learning opportunities, by graduation.
- SA 6.2** Nurture career-ready graduates through career training that equips students to succeed in an ever-changing and complex world of work. Provide undergraduate and graduate students with enhanced support for work experiences, internships and careers.
- SA 6.3** Look for ways to support and expand extra-curricular and professional development opportunities, such as student design teams, conferences, or clubs, while seeking ways to recognize their work through digital badges or micro-credentials.
- SA 6.4** In addition to the Smith Undergraduate Internship Program, develop a range of signature summer experience options with diverse opportunities for students to develop professional skills and gain meaningful work experience in the public, private and non-profit sectors.
- SA 6.5** Develop a plan for engaging the exceptional Smith alumni community as a key constituency for work-integrated learning experiences.

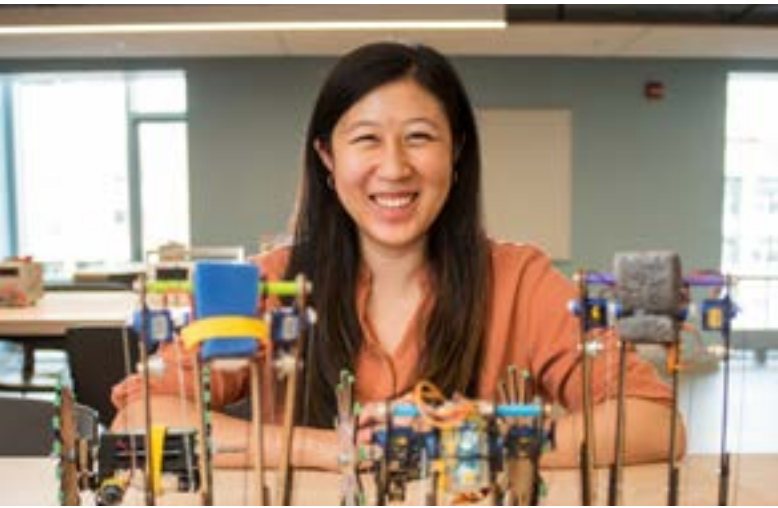




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Engineering for Everyone

Engineering for Everyone



Engineering teams solve complex problems, and complex problems require diverse and inclusive perspectives. Smith Engineering must prepare its students to graduate ready to tackle grand challenges – which will require inclusive, equitable, and expansive thinking that welcomes all backgrounds and perspectives.

We will build on our exemplary support services and current successes we are showing in the recruitment and retention of women students and faculty. Recruitment efforts to diversify the existing and future student body are already underway through initiatives such as the Indigenous Futures in Engineering program, First Generation Pathways initiative, institutional and student outreach activities, and others.

Re-thinking engineering education, and what it means to be an engineer, means ensuring that all students feel seen and represented. We understand that equity is not a goal to be reached, but a mindset of permanent evolution that increases our breadth of compassion and understanding continuously.

All our preceding initiatives drive toward this end: reframing research as multidisciplinary and comprehensive. Recalibrating our curriculum and learning and research spaces to foster inquiry and curiosity across disciplines. These are goals in and of themselves, but also further the effort to make engineering a field that can adapt and serve social projects that are embraced by a diverse group of current and future students.

Smith Engineering recruits top talent to our student body, in Canada and around the world. The Faculty needs to become even more competitive and attractive for curious students, both undergraduate and graduate, from diverse backgrounds. Our hiring practices must shift as well, to ensure a more diverse student body is supported by greater diversity and equity among our staff and faculty.



OBJECTIVE 7

Recruitment and diversity

Attract and enable access for intellectually curious and motivated domestic and international students from all backgrounds.

Supporting Actions

- SA 7.1** Modify recruitment and admissions procedures to admit students not only on their secondary school grades but also on their commitment to hard work, their strength of character and their desire to make a social impact through engineering.
- SA 7.2** Increase access to engineering at Smith for historically under-represented communities by developing new bursaries and scholarships.
- SA 7.3** Mobilize the voices of students from equity-seeking communities in outreach, communication and marketing campaigns and through the Queen's Equity Ambassadors program.
- SA 7.4** Develop academic pathway programs, prioritizing the creation of pathways at high schools and colleges in non-traditional recruitment areas, remote locations, as well as for international students who live both overseas and in Canada.





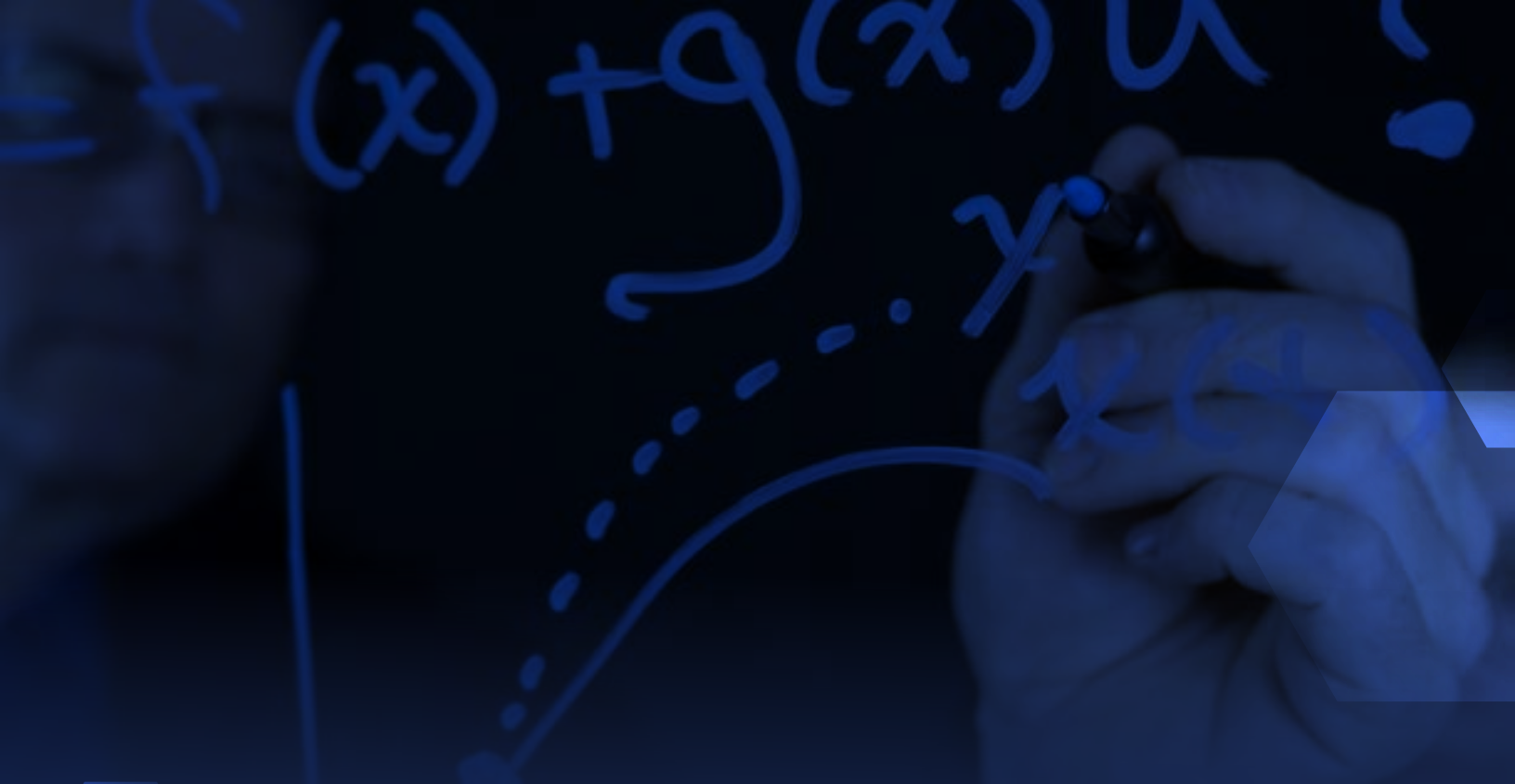
OBJECTIVE 8
Support and inclusion

Provide all students with holistic support and intentional inclusion.

- SA 8.1** Enhance the student support system for both academic and well-being that supports undergraduate and graduate students and particularly ensures that students from diverse backgrounds are set up for success.
- SA 8.2** Build off the success of the Indigenous Futures in Engineering program by using it as a template to develop programming to support other equity-seeking groups.
- SA 8.3** Make community inclusion more intentional by embracing and understanding different experiences, backgrounds, perspectives, and identities, and empower students of all backgrounds to develop leadership and entrepreneurial skills within and outside the classroom.
- SA 8.4** Partner with the Engineering Society to create the change in environment necessary to ensure students from under-represented groups feel a strong sense of belonging to the Smith Engineering community.
- SA 8.5** Commit to understanding and incorporating ways of knowing from nearby Indigenous nations, such as holistic framing of what makes a project necessary and what decolonizing curriculum means in an engineering context.

OBJECTIVE 9
Leverage diversity and inclusion among faculty, staff, and senior administrators

- SA 9.1** Implement regular education and training sessions for all faculty, staff, and senior administration in equity, diversity, inclusion and Indigenization.
- SA 9.2** Incorporate equity, diversity and inclusion criteria into every phase of the hiring process, including job posting, the composition of hiring committees, interview questions and other measures of candidate excellence.
- SA 9.3** Embed competency in equity, diversity, and inclusion as a requirement for all faculty, staff, and senior administrator positions.



This is a time where ambition and audacity are needed.

This plan is ambitious, and audacious – it is also the beginning of an evolving dialogue with our faculty, staff, students, alumni, and partners. We will develop and update this plan as a living document – not a list of tasks, but a guiding document as we foster diversity, push the frontiers of teaching, and hone our research excellence.

Together, we will build the future of Smith Engineering.

Queen's University is situated on the territory of the Haudenosaunee and Anishinaabek.

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