SMITH ENGINEERING
Queen's University

Undergraduate Handbook

Welcome to Smith Engineering

Future engineers,

I'm excited to see that you are taking the time to learn more about what Smith Engineering has to offer. You've entered a pivotal time in your life, where you will explore a world of possibilities and, ultimately, make a momentous decision about your future.

When I speak with our current students, I often ask, "How did you choose Smith Engineering?" The top three themes I hear relate to:

- **Common first year:** Our program is unique among Canadian engineering schools – we guarantee your top choice of program following the successful completion of your first year courses. With no limit on how many students can enter each discipline, we ease competition and foster a culture of collaboration.
- **Unrivaled student community:** You will find countless opportunities to get involved, from the Engineering Society's many student clubs and events to our design teams, who take their innovative engineering projects across Canada and worldwide for competitions.
- **Internships:** Our optional internship program allows you to take on meaningful work, earn a salary, and make lasting industry connections. Students take on real-world design projects beginning in first year and have access to career preparation resources throughout their degree.

While the above are all strong points to consider, I'll offer you one more reason to choose Smith Engineering:

You're going to love it here.

Make no mistake: engineering is a demanding area of study, as should be expected for a demanding profession.

But you will also make friends for life, find a community of peers and mentors, and develop the skills that will help you tackle the important challenges facing the world.

I hope to welcome you to campus soon.

Best regards,

Kevin Deluzio, PhD, PEng, FCAE, FEIC
Professor and Dean for Smith Engineering

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Forefront of Engineering Education

With the support of the transformative $100M gift from Stephen Smith, we are dedicated to pioneering innovative approaches in engineering education. This generous contribution will empower us to enhance our curriculum, integrate cutting-edge technology, and provide unparalleled opportunities for hands-on learning and research.

At Smith Engineering, we are committed to maintaining the highest standards of excellence while also pushing the boundaries of what is possible in engineering education. Our students are equipped with the skills and knowledge needed to excel in a rapidly evolving world.

Join us at Smith Engineering, where tradition meets innovation, and help us shape the future of engineering.

Engineering Admission

Smith Engineering empowers you to make the choices that shape your future. Our Common First Year program guarantees your choice of discipline. You can also choose a leading direct entry program to specialize in immediately.

Common First Year and Guaranteed Discipline Choice

OUAC Code: QE

Begin with a common first year of engineering fundamentals before choosing your program from the list of 10. Your top program choice is guaranteed, provided you pass all your first-year courses and apply by the winter term deadline.

- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Engineering Chemistry
- Engineering Physics
- Geological Engineering
- Mathematics and Engineering
- Mechanical and Materials Engineering
- Mining Engineering

Direct Entry Programs

- Mechatronics and Robotics Engineering – *OUAC Code: QEM*
- Computer Engineering – *OUAC Code: QEC*

Internship

Our optional paid internship program is available in all engineering programs.

Admission Requirements

Smith Engineering admission average for Ontario curriculum applicants is based on five prerequisite subjects:

- English 4U
- Physics 4U
- Chemistry 4U
- Functions 4U
- Calculus and Vectors 4U

For the admission requirements for out-of-province, international, and specialized curriculum applications, information on how to apply, fees and financial aid information, and all other admission-related information, please visit the Queen's Admission website.

Undergraduate Admission

queensu.ca/admission

Internships

Looking to test-drive your career? Our optional internship program supports paid, professionally supervised, career-related positions giving you real-world experiences as part of your academic journey.

Internship Advantages

- Earn a full salary while retaining your student status and benefits
- Earn a technical elective credit for your time spent on internship
- Build your skills and professional network
- Add a “Professional Internship” designation to your degree

How It Works

- Opt in to the internship program any time before third year
- Take advantage of our internship prep resources like job fairs, resume support, and interview practice sessions
- Explore our internal job board, which lists thousands of positions
- Apply to as many positions as you like, accept interview requests, and accept an offer
- Enjoy your internship, make the most of your time on the job, and develop strong connections and skills

Preparation

Smith Engineering is committed to your professional growth from first year until you graduate. This includes our unique Engineering Career Accelerator Program (ECAP) which is embedded within our core curriculum and actively prepares our students for internships while simultaneously working with business partners to ensure a productive and impactful real-world learning experience.

$51,000
average salary

12–16
months to gain real industry experience

Rylan’s Intern Experience

“For any students considering an internship at Queen’s, I would highly recommend it. I’ve had a great experience working here, and I couldn’t recommend it enough. I think the experience is invaluable, graduating with 12-16 months of actual professional experience, and I couldn’t imagine graduating without it now.”

Rylan Richter,
Sc’22 Mechanical Engineering
Intern Project Coordinator

Your First Year

Smith Engineering fosters collaboration, support, and balance in your studies. You will have a strong community to encourage you as you build your engineering foundation and explore your interests.

Skills You'll Learn

- Fundamental engineering principles
- Professional skills
- Teamwork and collaboration
- Design methodologies

Course Highlights

- Engineering Design and Practice
- Introduction to Computer Programming for Engineers
- Applied Engineering Mechanics
- Engineering Graphics
- Earth Systems Engineering
- Chemistry and Materials

For a complete course list, please visit our website.

smitheng.ca/courses

97%
Year 1 - 2
retention rate

1,000
engineering students
in first year

Design Projects

Your first year Engineering Design and Practice courses will help teach you the problem-solving skills needed to tackle engineering projects. You will team up into groups, and work to solve a real-world problem posed by a community member (your client). At the end of the year, your team will present your final design to the client. In some cases, this design is implemented!

Past projects include:

- All-seasons mobile greenhouse for student café
- App of accessible locations on campus
- Model of a grain elevator for a museum
- 911 Operator training system

Collaborative Spaces

Our main engineering building, Beamish-Munro Hall, was built to support active learning. There are over 30 bookable spaces throughout the building for engineering students to study and work on group projects.

You Belong Here

Indigenous Students at Smith Engineering

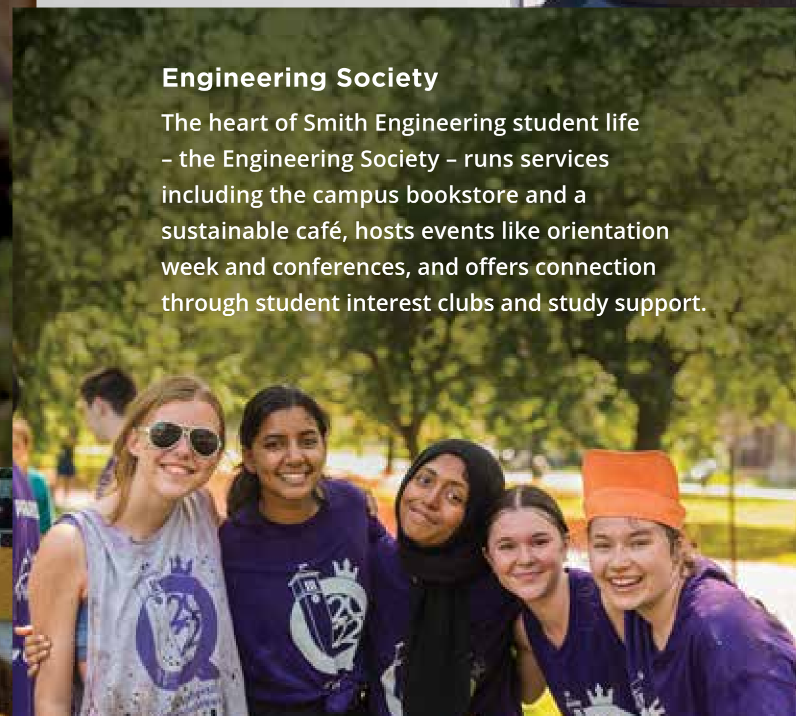
A dedicated student meeting space, tutoring, research opportunities, social excursions, conferences, and much more are made available through Indigenous Futures in Engineering.

Community and Student Groups

Student clubs create important spaces for our students to find support and connection. Engineering clubs include EngiQueers, the Queen's Chapter of the National Society of Black Engineers, Women in Science and Engineering, RoboGals, and many more.

Engineering Society

The heart of Smith Engineering student life – the Engineering Society – runs services including the campus bookstore and a sustainable café, hosts events like orientation week and conferences, and offers connection through student interest clubs and study support.



Design Teams

There are 18 design teams including Biomedical Innovation, Baja SAE, Hyperloop Design, and the Queen's Space Engineering Team! These teams collaborate on creative engineering projects and many finish the year with a national or international competition.

Chemical Engineering

Looking to make a lasting impact on the world around you? Chemical engineers improve the processes that produce food, medication, fuel energy, biomedical devices, and much more.

In this program, you will learn how to design safe, efficient, sustainable, and economical processes and products. You'll learn to analyze and design the chemical processes that span from molecular to macroscopic scales. Your education will cover the diversity of knowledge needed in chemical engineering. From mathematics, chemistry, physics, and biology, to engineering science, design, and economics, chemical engineers use a wide range of expertise to work towards a single goal.

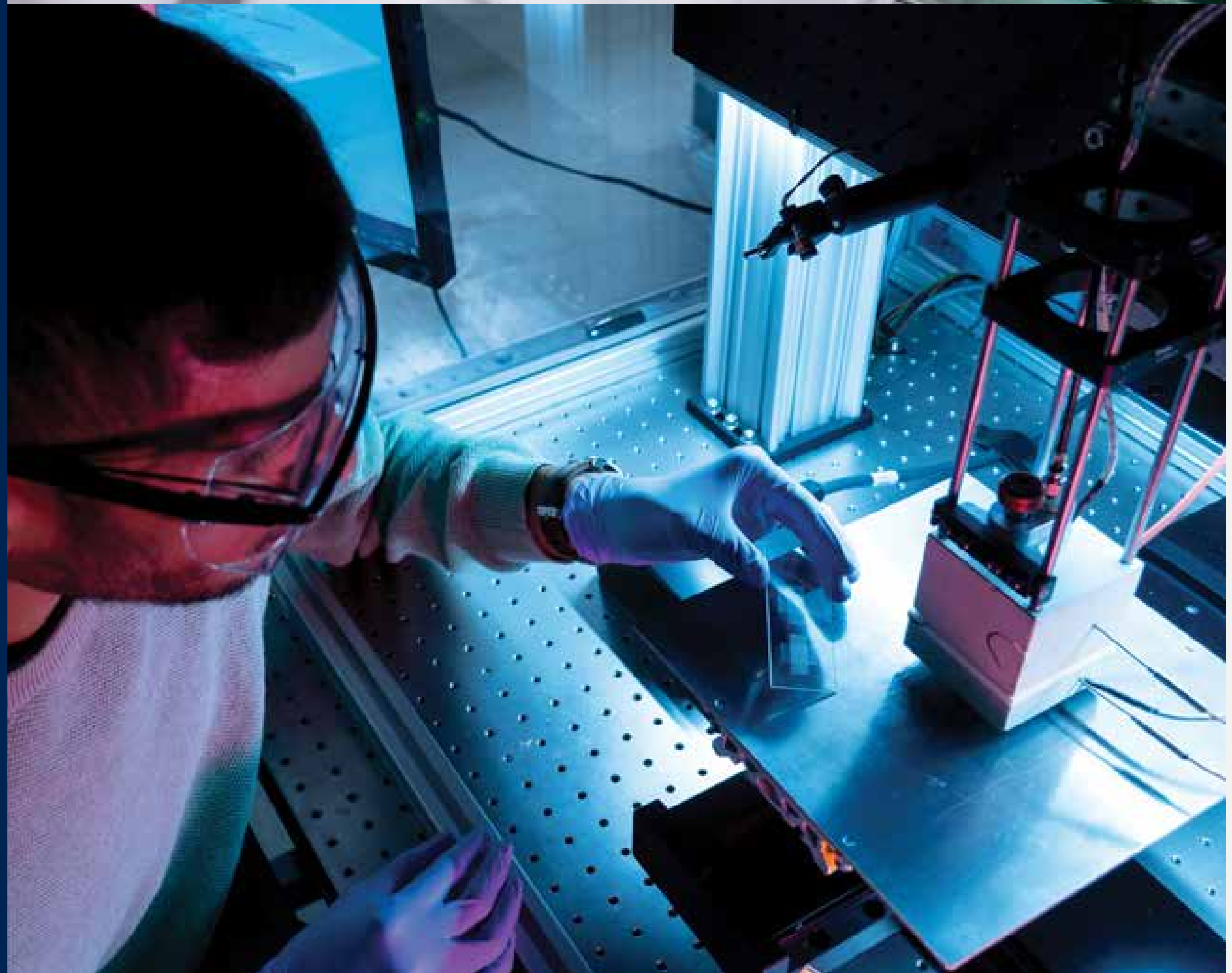
Options

- Chemical Process Engineering (CHE1)
- Biochemical Engineering (CHE2)
- Electives in the areas of: biochemical, biomedical, environmental, process systems engineering, energy, and materials

Careers

Biotechnology, process industries, food and agricultural science, oil, gas and alternative energy, environmental sustainability and remediation, biomedical engineering, pulp and paper, pharmaceutical production, polymer and polymer products manufacturing, specialty chemicals and mineral processing

smitheng.ca/chemical



Program Timeline

Common First Year

Second Year

Courses include Analysis of Process Data, Chemical Processes and Systems, Main Group Chemistry, Principles of Chemical Reactivity, Ordinary Differential Equations, Thermodynamics of Energy Conversion Systems, Process Dynamics and Numerical Methods, Fluid Mechanics, and Applied Organic Chemistry. You will take Engineering Design and Practice, a laboratory project course, and Transport Phenomena Fundamentals (CHE1) or Cell Based Engineering Principles (CHE2).

Third Year

Courses include Fluid Phase and Reaction Equilibrium, Chemical Reaction Engineering, Heat and Mass Transfer, Biochemical Engineering, Process Dynamics and Control, Design of Unit Operations, Engineering Communications, Ethics, and Professionalism, and Mitigation of Industrial Pollution. You will take another laboratory projects course, and Environmental Biotechnology and Biomedical Engineering (CHE2) or Industrial Catalysis (CHE1).

Paid Internship Option

Final Year

Courses include Strategies for Process Investigations, Engineering Innovation and Entrepreneurship, Design of Manufacturing Processes, and Transport Phenomena. You will also choose 5-6 courses based on your option, which may include research thesis project or multi-disciplinary design projects.

Civil Engineering

Civil engineering offers unique opportunities to shape society and the world we live in. Learn to design, plan, and build structures and systems while protecting our natural environment and ecosystems from the effects of climate change.

This program covers the key areas of civil and environmental engineering, including the static and dynamic behaviour of structures and materials, how the natural environment affects infrastructure, and how human activities affect the natural and built environments, and elements of design. With a strong focus on industry connections and developing professional skills, you'll be prepared to thrive in the dynamic and creative field of civil engineering.

Streams

Suggested focus areas include:

- Structural Engineering
- Geotechnical Engineering
- Hydrotechnical Engineering
- Environmental Engineering

Careers

Structural design and construction, water resources and environmental engineering, geoengineering and natural hazard mitigation, waste management and water quality

smitheng.ca/civil

Program Timeline

Common First Year

Second Year

As a Civil Engineering student, you will start your second year by participating in Civil Week, a group-based design challenge. Courses include Chemistry for Civil Engineers, Applied Mathematics and Numerical Methods, Solid Mechanics, Materials, Hydraulics, and Engineering Economics. You will also take the second Engineering Design and Practice course. Finally, you will take one Humanities and Social Science Complementary Studies course.

Third Year

Courses include Structural Analysis, Geotechnical Engineering, Hydraulics and Water Resources, Groundwater Engineering, Structural Steel Design, Water and Wastewater Engineering, and Design and Practice. You will also take one Complementary Studies course, plus one Management Elective.

Paid Internship Option

Final Year

Civil Engineering students take a core Capstone course in Civil Engineering Design and Practice. You will also need to select eight Technical Electives that will allow you to specialize or broaden your experience. You have the opportunity to do an undergraduate research based thesis as well if you choose. Finally, you will need to choose one Complementary Studies course.

Computer Engineering

Computer engineers join digital hardware and computer science to develop advanced computer systems and leading-edge software. In this program, you will study circuits, electronics, digital systems, microprocessors, computer architecture, data structures, algorithms, computer networks, operating systems, and software specification and development.

Direct Entry Option

Students can choose to apply to the Computer Engineering program directly. Your first year will build up your engineering fundamentals, with updates focused on developing computer engineering skills earlier and access to electives in your upper years. During your first-year labs and tutorials, you will be grouped with peers who share a passion for Computer Engineering.

Students who choose the general common first-year path and pass all their first year courses can also join the Computer Engineering program at the end of first year.

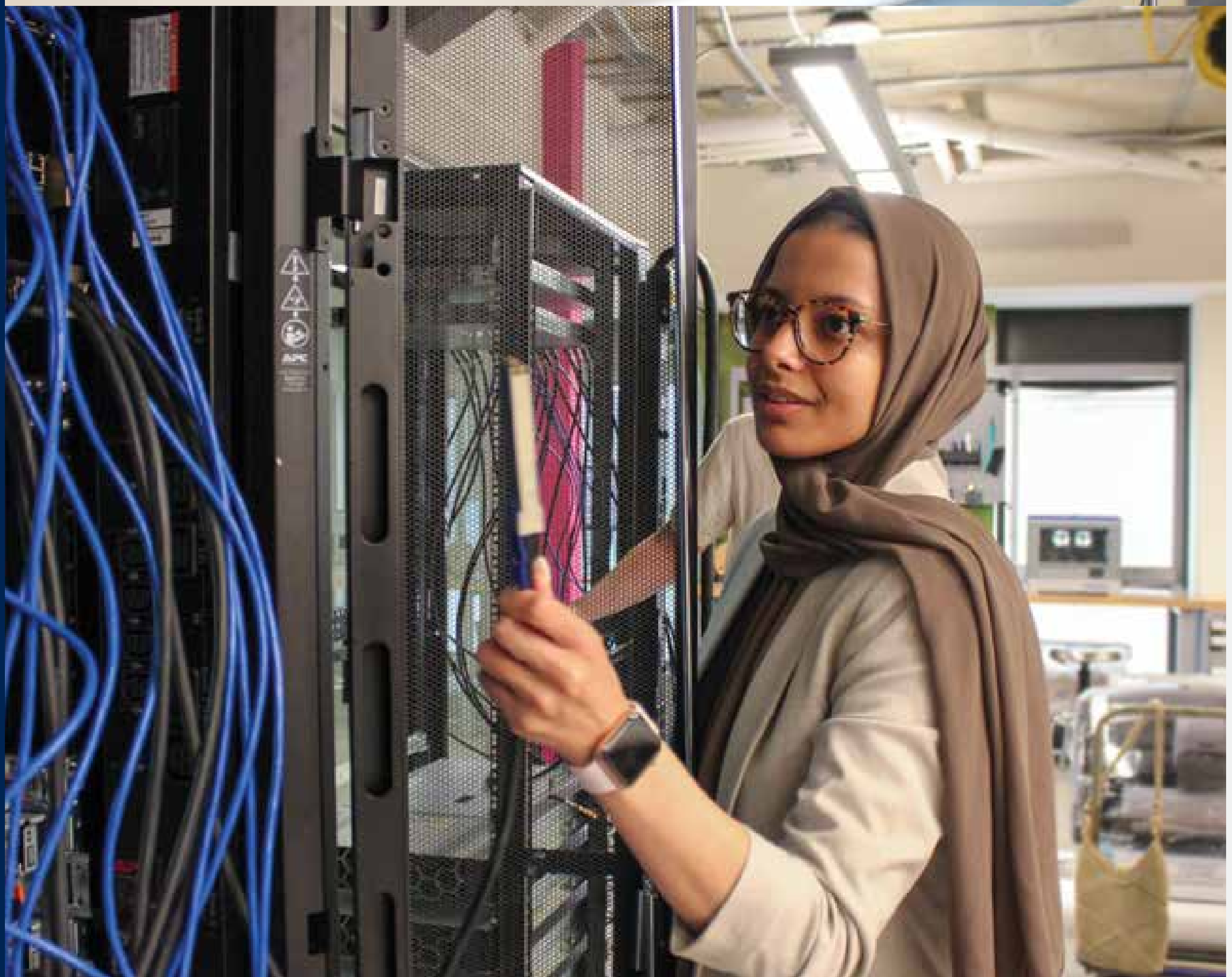
Streams

- Artificial Intelligence
- Computer Hardware
- Computer Systems
- Software Engineering
- Mechatronics

Careers

Aerospace software, ambient/artificial intelligence, autonomous systems, biomedical engineering, computer architecture, computer vision and optical processing, cybersecurity, game development, integrated circuit design, medical informatics, mechatronics, wearable technology

smitheng.ca/computer



Program Timeline

First Year

Students in the Common First Year program will begin with fundamental engineering courses. Direct Entry students will have a customized curriculum offering.

Second Year

Courses include Electric Circuits, Digital Systems, Information Structures, Differential Equations, Computing Science, Mechatronics Project, Electronics, Discrete Mathematics, Computer Architecture, and Electromagnetics. You will take the second Engineering Design and Practice course, plus one Complementary Studies course.

Third Year

Courses include Microprocessor Interfacing and Embedded Systems, Operating Systems, Probability and Random Processes, Algorithms, Computer Networks, Digital Systems Engineering, Engineering Economics, and a course in either Software Specifications or Software Development. You will also take the Electrical and Computer Engineering Design Course. You will also take two Technical Electives, plus one Complementary Studies course.

Paid Internship Option

Final Year

All Computer Engineering students follow up their ECE Design course with the Computer Engineering Project course. You will also need to choose approximately 7-8 Technical Electives, plus one Complementary Studies course. You may also take a Research Project course.

Electrical Engineering

Electrical engineering is a broad discipline that spans from the physical world to the purely information-based world. Electrical engineers are the minds that develop electronic circuits, semiconductor lasers, microprocessors, electric motors, data communications systems and networks, intelligent robotic systems, medical instruments, avionics, and more.

In this program, you will build on a base of applied mathematics and physics and learn to use the laws of physics that govern electrical systems to design new products and services, attaining the skills you need to succeed as an electrical engineer.

Streams

- Biomedical Engineering
- Communications and Signal Processing
- Communications Systems and Networks
- Microelectronics and Photonics
- Mechatronics
- Power Electronics and Systems
- Robotics and Control

Careers

Autonomous robotics, ambient intelligence, aviation and aerospace, biotechnology, component design, consumer electronics, digital systems fibre and laser electro-optics, game development/design, green power, sensory systems, semiconductor design, security systems, wearable technology, wireless data networks and systems

smitheng.ca/electrical

Program Timeline

Common First Year

Second Year

Courses include Signals and Systems I, Electric Circuits, Digital Systems, Information Structures, Mechatronics Project, Electronics I, Numerical Methods and Optimization, Computer Architecture, Electromagnetics, Differential Equations, and Complex Analysis. You will take the second Engineering Design and Practice course, plus one Complementary Studies course.

Third Year

Courses include Signals and Systems II, Electronics II, Microprocessor Interfacing and Embedded Systems, Electromagnetics, Probability & Random Processes, Engineering Economics, and Solid State Devices. You will also take two Technical Electives and one Complementary Studies course.

Paid Internship Option

Final Year

You will take the Electrical and Computer Engineering Design Course. You will also choose approximately 7-8 Technical Electives, plus one Complementary Studies course.

Engineering Chemistry

Engineering Chemistry connects chemistry and engineering design, to discover innovative solutions for the most challenging problems in the chemical sciences.

The only program of its kind in North America, our Engineering Chemistry program is dually accredited - meaning when you graduate, you will be eligible to become both a chartered chemist and a professional engineer. As a graduate of this program, you'll have a strong grasp of fundamental science and the engineering tools needed to put this knowledge into practice. This program integrates advanced knowledge of organic chemistry, analytical chemistry, and electrochemistry into the design curriculum.

Streams

Upper-year electives offer courses in areas including:

- Chemical Diagnostics
- Alternative Energy
- Process Synthesis

Careers

Agricultural sciences, alternative energy, biomedical engineering, chemical/process engineering, environmental engineering, food science and technology, forensic science, fuels and petrochemicals, mineral processing, pharmaceuticals, polymer/rubber/plastic technology

smitheng.ca/chemistry

Program Timeline

Common First Year

Second Year

Courses include Analysis of Process Data, Chemical Processes and Systems, ChemEtronics, Main Group Chemistry, Principles of Chemical Reactivity, Ordinary Differential Equations, Thermodynamic Properties of Fluids, Process Dynamics and Numerical Methods, Fluid Mechanics, Methods of Structure Determination, and Applied Organic Chemistry. You will take the second Engineering Design and Practice Course.

Third Year

Courses include Fluid Phase and Reaction Equilibrium, Chemical Reaction Engineering, Biochemical Engineering, Heat and Mass Transfer, Introduction to Chemical Analysis, Transition Metal Chemistry, Experimental Chemistry, Design of Unit Operations, Engineering Communications, Ethics and Professionalism, and Organic Process Development. You will also choose three units of Electives and take the Engineering Economics course.

Paid Internship Option

Final Year

Courses include Applied Surface and Colloid Science, Quantum Mechanics, Design of Manufacturing Processes, and Electrochemical Engineering. Additionally, you will take a laboratory projects course and your fourth year Research Project course. You will also choose the rest of your electives.

Engineering Physics

Engineering Physics teaches you to apply the knowledge of fundamental physical principles underlying modern technology and processes.

Within your chosen area of specialty, you'll study a strategic combination of math, physics, and engineering courses. You will learn fundamental physical principles and theoretical tools for professional practice, and a firm foundation in modern experimental techniques. With courses in quantum mechanics, laser optics, and nanotechnology, you will be prepared for an engineering career at the leading edge of technology.

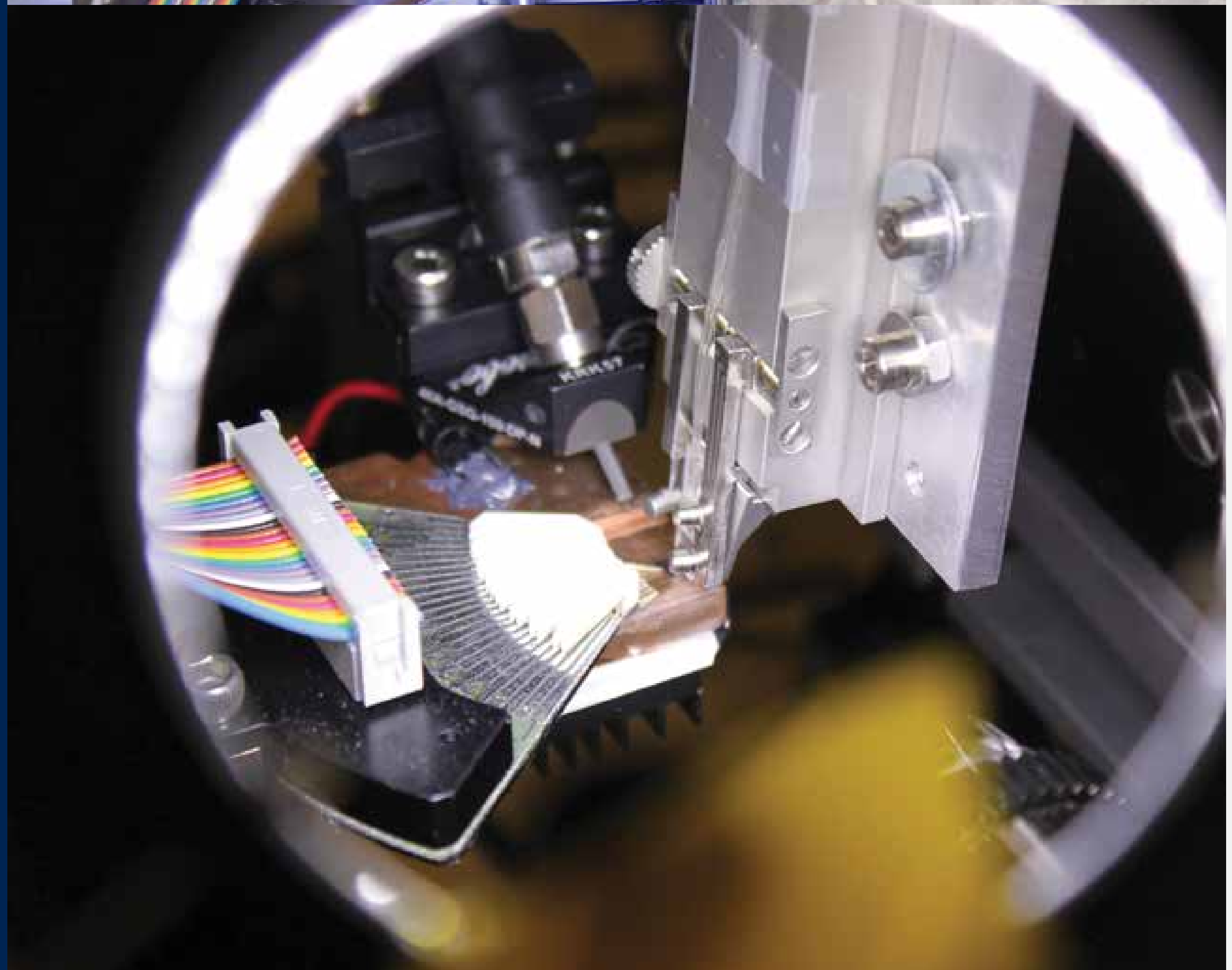
Options

- Mechanical
- Electrical
- Materials
- Computing

Careers

Aerospace, automotive, astrophysics, atmospheric science, biophysics, computer engineering, energy (nuclear, solar, wind, etc.), environmental management, financial modelling, forensic science, nanotechnology, nuclear engineering, semiconductor and electronic engineering, satellite engineering, software engineering

smitheng.ca/physics



Program Timeline

Common First Year

Second Year

You'll take a second engineering design course, connecting the physics you learn to the technology that helps society. More hands-on experience comes in physics and electronics laboratories. You start taking courses in your option alongside your courses in physics, which will include Relativity and Quanta, Electricity and Magnetism, and Computational Engineering Physics.

Third Year

Courses deepen your knowledge of physics from both a theoretical and practical side. Your third engineering design course deepens your ability to work as a team taking on technical challenges. Take 3-4 courses with engineering students in your chosen option. Courses range from digital systems to materials processing, from transistor circuits to fluid mechanics - depending on your chosen option. Consider applying to the Accelerated Master's program.

Paid Internship Option

Final Year

All Eng Phys students participate in the "capstone" team-based project course in addition to an individual engineering thesis, an advanced laboratory course, and a high-level electromagnetic theory course. Choose technical elective courses from a huge range, including Laser Optics, Robotics, Computer Vision, High Performance Computing in Engineering Physics, Aerodynamics, and General Relativity.

Geological Engineering

Geological engineers connect Earth sciences with engineering. They apply geosciences, mathematics, computing, physics, and chemistry to solve challenges in fields including infrastructure engineering, mining, environmental engineering, forensic engineering, and forestry.

There are many opportunities in the Geological Engineering program to gain field experience – most students gain over 200 hours of experience on various field trips. You will study physics, chemistry, mechanics, and applied mathematics as well as natural processes that shape the Earth such as earthquakes, volcanoes, tectonics, mountain building, erosion, and sedimentation.

Streams

Areas of specialization include:

- Geotechnical Engineering
- Geoenvironmental Engineering
- Applied Geophysics
- Mineral and Energy Exploration

Careers

Environmental engineering, geophysics, groundwater protection and management, mining geomechanics and environmental sustainability, natural hazard mitigation, tunnel engineering, hydro-power development, mineral resource exploration and sustainable extraction, urban infrastructure engineering, hazardous waste management, geothermal energy

smitheng.ca/geological

Program Timeline

Common First Year

Second Year

Courses include Solid Mechanics, Field Methods, Mineralogy, Surficial Processes, Statistics, Earth Systems Engineering, History of Life, Economics, Petrology and Earth Materials, Geophysical Characterization of the Earth, and Differential Equations. You will also take the second Engineering Design and Practice course, with a focus on Geological Engineering Design. In the Fall term of second year, students gain hands-on experience by taking Geological Engineering Field Methods.

Third Year

Courses include Rock Structures, Soil Mechanics, Applied Hydrogeology, Applied Quantitative Analysis, Resource Engineering, Applied Geophysics, Site Investigation and Geological Engineering Design, Terrain Evaluation, Rock Mechanics, and Geochemical Characterization of the Earth. In addition to three Complementary Studies courses, you will also take four Technical Electives in third and fourth year to specialize or diversify in Geological Engineering. In August, before the third year Fall term begins, students will experience a week long Geological Engineering Field School.

Paid Internship Option

Final Year

Courses include Fourth Year Design Project. You will have lots of room this year to create your own specialized or diversified program through technical electives, developing additional expertise in geotechnical and rock engineering for mining, tunneling, or construction; mineral or energy exploration and resource development, geoenvironmental engineering, and engineering geophysics.

Mathematics and Engineering

Modern electrical, mechanical, communications, control, and artificial intelligence systems require sophisticated mathematical tools.

In addition to taking engineering courses in subjects related to their area of specialization, Mathematics and Engineering students benefit from very high level, tailor-made, mathematically enriched courses, which have no equivalent in traditional engineering undergraduate programs. As a result, students in the program learn engineering principles with a mathematical depth that is unseen in any other North American engineering program, and graduate not only with a deep engineering expertise in their area of specialization, but also with exceptionally strong analytical and problem solving skills.

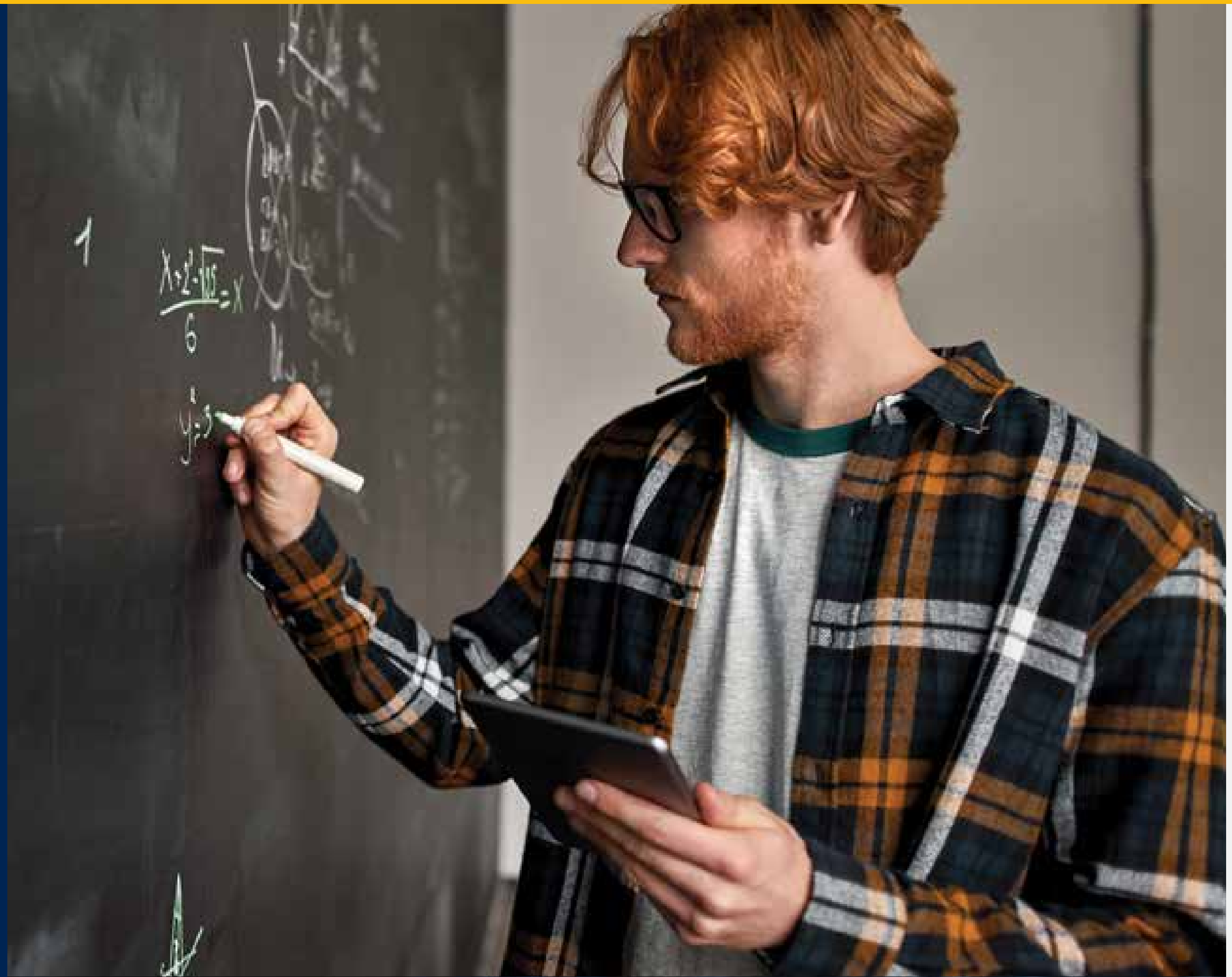
Options

- Applied Mechanics
- Computing and Communications
- Systems and Robotics

Careers

Aerospace, artificial intelligence, biomedical engineering, computer engineering, computer vision and image processing, control systems, cryptography, data analysis and data mining, fibre and laser electro-optics, financial analysis, mechatronics, satellite communications, software design, information technology

smitheng.ca/mathematics



Program Timeline

Common First Year

Second Year

Courses include Algebraic Structures, Differential Equations, Advanced Calculus, Real Analysis, and Linear Algebra. You will take the second Engineering Design and Practice course. Your other 5-6 courses depend on your option.

Third Year

Courses include Functions of a Complex Variable, Mathematics of Engineering Systems, Probability, Engineering Design and Practice, and Engineering Economics. Your other 6-7 courses depend on your option and may also include several additional Mathematics and Engineering courses such as Probability II and Introduction to Operations Research.

Paid Internship Option

Final Year

Courses include Mathematics and Engineering Seminar and the Engineering Mathematics Design Project course. Your remaining courses will depend on your option and include specialized advanced courses including Information Theory, Control Theory, Continuum Mechanics, Data Compression and Source Coding, Optimization and Control of Stochastic Systems, and Stochastic Processes & Applications, and many technical electives in engineering, applied and pure mathematics, and statistics.

Mechanical and Materials Engineering

Mechanical engineers are needed wherever there are machines or devices – including the human body. Their work covers every stage of design, manufacturing, testing, operation, and research.

Our Mechanical and Materials Engineering program builds on a solid foundation with courses that are vital in mechanical engineering, including kinematics and dynamics, materials and manufacturing methods, thermodynamics and fluid mechanics, controls, mechatronics, and machine design. You will be prepared with the professional skills needed to excel in the broad field of mechanical engineering, with opportunities in your upper year to specialize and tailor your expertise.

Options

- General Mechanical Engineering
- Materials
- Biomechanical

Careers

Aerospace, automotive, biomechanics, biomedical technology, manufacturing, materials engineering, nuclear engineering, product design, sustainable energy systems, robotics, structural analyst

smitheng.ca/mme

Program Timeline

Common First Year

Second Year

Courses include Solid Mechanics, Mathematics + Computational Tools, Manufacturing Methods, Thermodynamics, Materials, Measurement for Mechatronics, Electronic Circuits + Motors for Mechatronics, Kinematics and Dynamics and Fluid Mechanics. You will take the second Engineering Design and Practice course. Students decide to enroll in one of the following options: ME1 General, ME2 Materials, or ME3 Biomechanical.

Third Year

Courses include Engineering Economics, Solid Mechanics, Dynamics and Vibration, Machine Design, Heat Transfer, Automatic Controls, and Digital Systems for Mechatronics. ME1 students will continue with advanced thermodynamics and fluid mechanics. ME2 students will continue with additional materials processing and fracture mechanics courses. ME3 students will dive into the world of biomechanical engineering.

Paid Internship Option

Final Year

Courses include Capstone Team Project: Conceive and Design; Team Project; Implement and Operate; and a selection of technical electives based on your option. On top of your technical electives, you will choose three or four Complementary Studies courses to complete your degree.

Mining Engineering

Society needs metals and their production relies on mining, mineral processing and metal extraction. Some metals, particularly those deemed critical to the global energy transition, are needed in larger quantities than ever before.

The Mining Engineering program will teach you how to improve the safety, efficiency, and sustainability of mineral resource extraction operations, contributing to a reliable supply of the raw materials required to develop green technologies. You'll study the wide range of disciplines involved in mineral resource projects from mineral exploration to mining, processing, and refining.

Throughout the program, you will also learn about developing technologies that produce by-products from waste, and how these technologies help society move toward a circular economy. You'll learn a broad range of engineering skills, and become familiar with the environmental and social drivers that are essential to responsible and sustainable resource extraction.

Options

- Mining Engineering (General)
- Mineral Processing and Environmental Engineering
- Mine Mechanical Engineering

Careers

Banking and venture capital, executive (management through c-suite), consulting, environmental management, equipment designer, mine engineer, reliability engineer, mineral exploration, software developer, metallurgist, reliability engineer, project engineering, process engineer, renewable resources, waste management

smitheng.ca/mining

Program Timeline

Common First Year

Second Year

Courses include Solid Mechanics, Differential Equations, Thermodynamics, Statistics, Data Analytics, Engineering Economics, Electric Circuits and Machines, and Numerical Methods. You will take the second Engineering Design and Practice course.

Third Year

Courses include Drilling and Blasting, Mineral Separation, Open Pit Mining, Geological Aspects of Mineral Deposits, Mineral Economics and Rock Mechanics, Hydraulics, Applied Underground Mining, and Operations Research. Your other courses depend on your option.

Paid Internship Option

Final Year

Courses include Reliability, Maintenance, and Risk Assessment, Mining and Sustainability, Occupational Health and Safety, Life-cycle Assessment for Green Technologies, as well as your fourth year project course(s). Your other courses depend on your option.

DIRECT ENTRY PROGRAM

Mechatronics and Robotics Engineering

From industrial automation to robotics to autonomous vehicles, the Mechatronics and Robotics Engineering (MRE) program covers this rapidly evolving field.

This program integrates computer, electrical, and mechanical engineering, with key hands-on focus on signals and systems, sensors and actuators, heat transfer, fluid power, data structures, intelligent machines and autonomous systems. Lab courses in the MRE program are designed to reflect real-world applications of mechatronics and robotics theory, whether that's troubleshooting systems integration, analyzing heat transfer in micro-electronics, coding an autonomous robot, or full-scale client-based design projects.

Concentrations

- Automation
- Biomedical
- Intelligent Systems
- Robotics

Careers

Aerospace, autonomous vehicles, biotechnology, food production, green power, manufacturing, pharmaceuticals, telecommunications

smitheng.ca/mre

Program Timeline

First Year

MRE is a direct entry program – meaning you begin in the program right away. MRE students participate in many of the common first year courses, as well as some that are MRE-specific. You will take Mechatronics and Robotics Design I, the first course in the four-year design spine.

Second Year

Courses include Fluid Mechanics and Fluid Power, Signals and Systems, Thermodynamics and Heat Transfer, Electric Circuits, Digital Systems, Kinematics and Dynamics, Electronics, Complex Analysis, and Computer Architecture. You will take Mechatronics and Robotics Design II.

Third Year

Courses include Sensors and Electric Actuators, Probability and Random Processes, Industrial Automation, Robotics, Microprocessor Interfacing and Embedded Systems, Numerical Methods and Optimization and Automatic Control. You will take Mechatronics and Robotics Design III.

Paid Internship Option

Final Year

All MRE students take two core courses (Mechatronics and Robotics Design IV, and Intelligent Machines and Autonomous Systems), two Complementary Studies courses, three Free Technical Electives, and five Primary Electives which can be selected from four recommended concentrations: Automation, Biomedical, Intelligent Systems, and Robotics.

Student Supports

We know that success goes beyond academics. We have a team here to support your well-being both personally and academically, as well as a range of peer-led supports to help you navigate your time at Queen's.

Our supports include:

- Dedicated engineering advisors for first year and upper year programs, international students, and academic accommodations.
- Study skills workshops and extra after-hours peer-led help sessions for first-years.
- Mentorship programs to support the transition to university. International engineering students will automatically be paired with a mentor.
- Personal counsellors and workshops to foster wellness.
- Extended Program, which allows first year students to retake failed fall courses (Physics, Chemistry, and/or Calculus) condensed in early winter term. This allows them to get back on track in early summer.

Engineering Summer Online Prep

The support starts before you even step foot on campus - we offer a free series of optional self-directed summer modules and quizzes for incoming students. Brush up on your skills in Math, Physics, Chemistry, and Programming, and start your first year with confidence.

Degree Options

Smith Certificate in Business

Customize your degree and broaden your career opportunities with the Smith Certificate in Business. Ideal for students who are interested in exploring the world of business, this certificate program includes finance, accounting, and marketing courses.

International Exchange

Smith Engineering is partnered with over 50 schools across 13 countries, offering students the opportunity to travel, immerse themselves in a new culture and often language, and experience campus life in another nation.

Dual Degrees

Do you have a passion for a second field of study? Dual Degrees allows students to work toward two degrees at the same time - your engineering degree and an Arts and Science degree. This typically takes an extra year to complete.

Research and Graduate Opportunities

Interested in research? Get paid as undergraduate research assistant or conduct research as part of an undergraduate thesis. Some programs also offer an accelerated master's option, allowing you to start working toward a MASc in your final year.

Certificates

Strengthen your skills in an area of interest by adding a certificate to your degree. Certificates demonstrate specialized knowledge and can help you stand out in your career. Popular certificates include the Certificate in Business, Certificate in Law, and Certificate in Entrepreneurship.

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