

Carleton 2018

FACULTY OF ENGINEERING AND DESIGN



Carleton
UNIVERSITY

FACULTY OF
Engineering
and Design

carleton.ca/engineering-design



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The Carleton Advantage

Welcome to Carleton University. Your future begins here.

The research-intensive Faculty of Engineering and Design at Carleton offers a unique and rewarding university experience from our beautiful campus overlooking the Rideau River and the Rideau Canal in Ottawa, Canada's national capital.

With a comprehensive range of innovative and unique engineering and design programs from which to choose, you have the flexibility to select the degree that best reflects your interests, aptitudes and career goals. Many of our programs offer additional opportunities for specialization through concentrations and streams. They can also be enhanced with co-operative education and fieldwork, providing real-world experience with industry that allows you to establish and develop your CV before you graduate.

You will be trained by expert professors who are renowned in their fields and engaged in research on both the national and international stage. You will have access to world-class facilities, including state-of-the-art wind tunnels and strong floors, microchip fabrication facilities and the latest in laboratories, design studios and advanced computer and networking platforms.

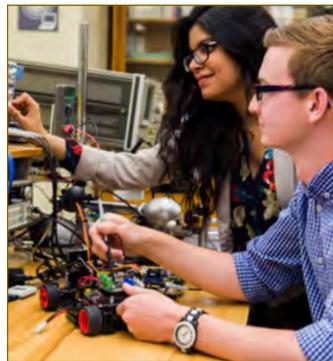
With your future in mind, Carleton provides a stimulating and supportive community for your studies in engineering and design. You will work on invigorating and challenging team projects, be inspired by industry guest speakers and express your creativity and innovation in preparation for a rewarding career in a highly desired field.

Welcome to Engineering and Design at Carleton.

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Message from the Dean



The research-intensive Faculty of Engineering and Design at Carleton University is recognized as one of Canada's leading institutions in the study and research of engineering, architecture, industrial design, and information technology. At Carleton, we offer programs that provide you with the best possible education and prepare you for a successful and satisfying career.

Carleton provides a stimulating and supportive community in which students work on invigorating and challenging team projects, are exposed to leaders of industry and research, and are given the opportunity to express their creativity and innovation in preparation for a rewarding career in a highly desired field.

You will be taught by faculty members who bring research expertise and industry experience to the classroom. Award-winning teachers, Canada Research Chair holders and extraordinary professors will share their passion for engineering and design with you.

Campus clubs and societies will help you explore new interests, take on leadership roles and meet new friends who share your creativity and curiosity. Co-operative Education also provides the opportunity for you to apply your knowledge and build your resumé before you graduate.

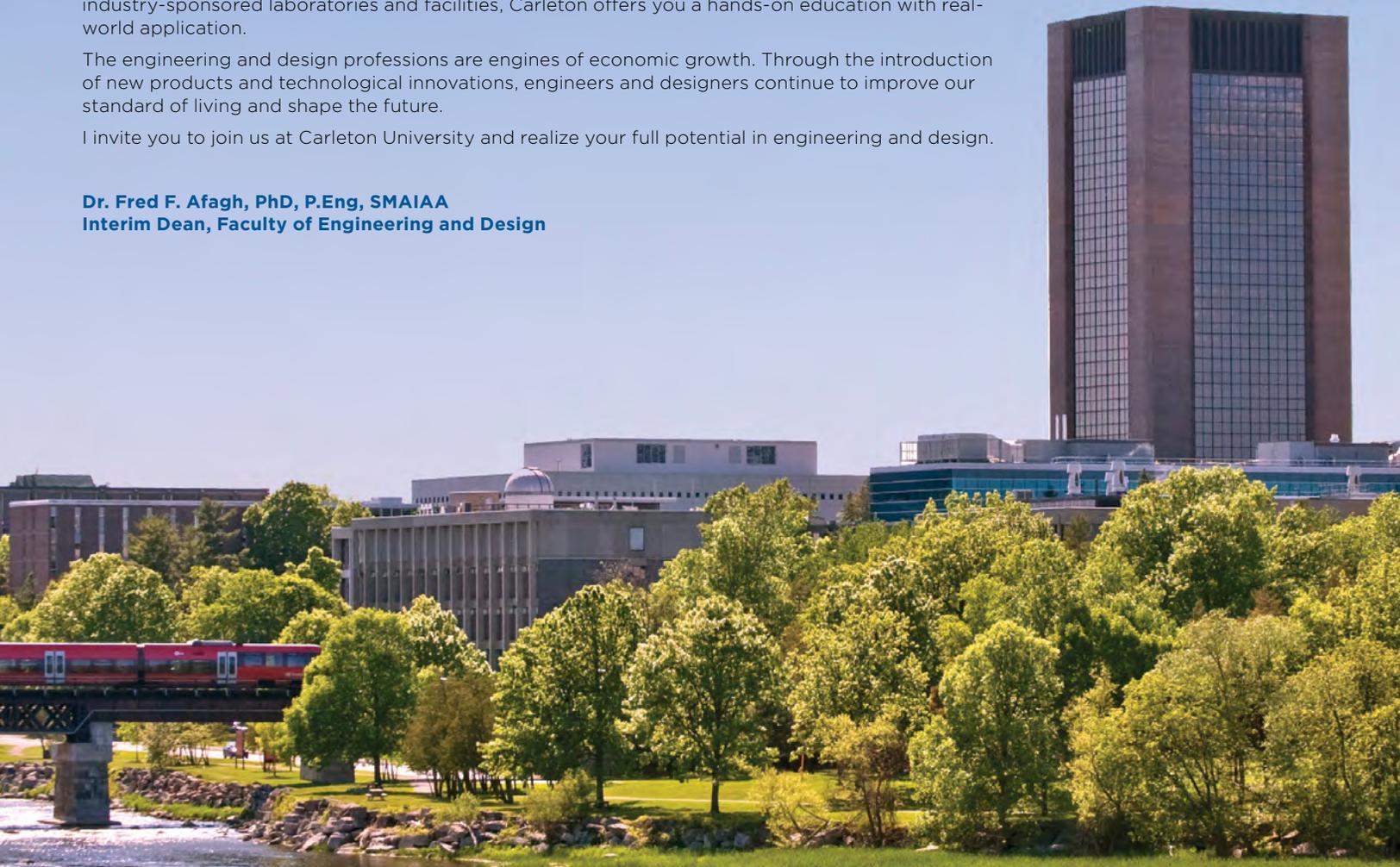
As Interim Dean, I am proud to represent the Faculty of Engineering and Design. We offer one of the most comprehensive platforms of engineering education in Canada at the undergraduate and graduate levels. Our program offerings continue to expand and adapt to the changing needs of society to ensure that our graduates will have the knowledge and skills that are highly desirable in today's fast-paced, technology-driven world.

With the latest equipment from corporate partners and continued investment in state-of-the-art, industry-sponsored laboratories and facilities, Carleton offers you a hands-on education with real-world application.

The engineering and design professions are engines of economic growth. Through the introduction of new products and technological innovations, engineers and designers continue to improve our standard of living and shape the future.

I invite you to join us at Carleton University and realize your full potential in engineering and design.

Dr. Fred F. Afagh, PhD, P.Eng, SMAIAA
Interim Dean, Faculty of Engineering and Design





Aerospace engineering student Turner Strang landed a co-op placement with the National Research Council's Flight Research Laboratory.

Gain Real-World Experience

Learning by doing is a rewarding enhancement to your academic studies in classrooms and laboratories. Combine your academic studies with periods of paid employment in your field through co-operative work terms. You will gain valuable experience in your field of study, develop professional contacts and earn money to help pay for your studies.

Co-op program

Co-operative education provides you with the opportunity to gain practical experience, solve real-world problems and apply classroom theory and knowledge to practical work situations. Each of our engineering and design programs includes a co-op option with work terms of 4, 8, 12 or 16 months, with one or multiple employers.* Co-op work terms typically begin at the end of your second year, when you have developed the knowledge and confidence to make a substantial contribution to the organization. As you gain more experience and enhance your skills, your work terms become longer—allowing you to complete projects and become involved with more ambitious, complex activities. The co-op program at Carleton is an invaluable investment – three or four work terms (depending on your program) add a co-op designation to your degree and will kick-start your career.

Recent employers

Carleton's co-operative education program offers outstanding national and local opportunities for rewarding, real-world experience in well-known organizations such as:

- Air Canada
- Amazon
- BlackBerry QNX
- Bombardier
- BGIS
- CAE
- Canadian Space Agency
- Ciena
- Department of National Defence
- Electronic Arts Canada
- EllisDon
- Ericsson
- Ford Motor Company of Canada
- GasTops
- General Dynamics Canada
- GM Canada
- Google
- Honeywell
- IBM
- Lockheed Martin
- National Research Council Canada
- Nokia
- Mattamy Homes

- Modern Niagara
- Parkin Architects Limited
- PCL
- PWGSC, Heritage Conservation Directorate
- Stantec
- Shopify
- Tesla Inc.
- Urban Lab Design

The national capital region is home to one of Canada's largest concentrations of government research agencies and high-tech companies. Opportunities are also available right here at Carleton, including working in a research lab for the summer, supported by federal research grants from agencies such as the Natural Sciences and Engineering Research Council.

You'll find Carleton grads at some of the hottest companies around the world such as Facebook, Twitter, Microsoft, and many more in addition to those listed above.

Career Development

Co-op and Career Services provides free career planning and advice, and helps connect you with potential employers through networking events, job postings and career fairs. From the first year of your studies, you can access services and programs that will help you make a successful transition from school to work.

* To participate in the Co-operative Education Program, students must apply and meet the entrance requirements.

carleton.ca/co-op



Engineering, Design and You

Recognized as a leader within Canada and beyond, Carleton's Faculty of Engineering and Design offers one of the most extensive ranges of programs in the country. You can graduate with the knowledge to design buildings, aircraft, software, telecommunications systems, medical devices, environmental solutions to pollution, or anything you can imagine. Carleton's Engineering and Design programs prepare you for rewarding careers in the real world, by providing you with knowledge and skills that are highly desirable in today's fast-paced, technology-driven society.

THE CAPITAL ADVANTAGE

Ottawa is a global technology leader. Sharing a city with some of the world's best tech companies and government laboratories offers excellent opportunities for co-op and internship placements, as well as a high number of prospects for future employment. Nearly 79,000 people in the national capital are employed by more than 1,800 tech companies, including multinational giants who lead the way in telecommunications, software, computer systems, aerospace, sensor technologies, the environment, security and defence, construction, semiconductors, and wireless technologies.

Carleton's Bachelor of Engineering, Bachelor of Architectural Studies, Bachelor of Industrial Design, Bachelor of Information Technology and Bachelor of Media Production and Design degrees will prepare you for an exciting career in a high demand field. Our programs will expose you to exciting technological advances in information storage, global communications networks, computer-aided design and 3D-image manipulation technologies.

From aircraft simulators, to advanced water and waste water treatment methods, to offshore structures, to new transportation approaches, to transistors that are smaller than most living cells...you'll be

amazed how your innovation can shape the future.

Learning by doing

Carleton's Faculty of Engineering and Design emphasizes problem solving through laboratory work, expanding your mind in a practical setting in order to prepare you for a rewarding career. You will be trained by internationally renowned faculty members who bring cutting-edge research expertise and industry experience to the classroom.

At Carleton, you will benefit from one of the best professor-to-student ratios in Canada in an environment that encompasses state-of-the-art research facilities. In the Faculty of Engineering and Design, we not only

teach, we generate new knowledge. Carleton delivers real-world training through partnerships with industry and collaboration with government departments and agencies. You will have the opportunity to apply your theoretical knowledge through co-operative education work terms with industry leaders located in the capital.

If you enjoy competition and teamwork, you will be able to test your knowledge and match wits with other university students by entering engineering and design competitions at the departmental, provincial or national levels. Undergraduate programs also culminate in the Capstone Fourth-Year

Project, during which teams of students produce a design innovation that encapsulates their studies with the Faculty of Engineering and Design at Carleton.

Areas of study

Carleton is one of the nation's leading institutions in the study and research of engineering, architecture, industrial design and information technology. Our comprehensive programs provide an outstanding education in an environment that is challenging, diverse and flexible. The Faculty of Engineering and Design offers the following areas of study:

ARCHITECTURAL STUDIES carleton.ca/architecture

As a student in the Azrieli School of Architecture and Urbanism, you can choose to concentrate your studies on architectural design, urbanism, or conservation and sustainability. You will begin your studies with courses in drawing, multimedia applications, art history and the social sciences.

As you progress, you will pursue your own research in workshops, gain exciting hands-on experience, visit local building sites and have the option to study abroad in your third year. You may also take part in our Student Design Clinic, in which senior students give real clients design ideas and advice on building renovations and additions.

When you graduate from the architecture program at the master's level you will meet the educational requirements for your professional registration from the Canadian Architectural Certification Board.

ENGINEERING carleton.ca/engineering-design

Carleton's engineering program ranks among the best in the country. Students begin with a common

foundation in mathematics, physical sciences and engineering principles. You have the choice of specialized engineering programs in aerospace, architectural conservation and sustainability, biomedical and electrical, biomedical and mechanical, civil, communications, computer systems, electrical, engineering physics, environmental, mechanical, software, or sustainable and renewable energy. Each discipline provides opportunities for you to specialize according to your interests and career goals.

INDUSTRIAL DESIGN id.carleton.ca

Industrial design bridges the gap between technological developments and the people that benefit from these innovations. In this program, you will learn the many elements that contribute to making technology serve society better. Starting with a firm base in mathematics, economics, psychology and physical sciences, Carleton's School of Industrial Design will introduce you to the modern production and innovation that goes into the development of all new products. You will study the aspects of design that make products successful—both technically and commercially—and have the opportunity to highlight your work in an annual exhibition that has become a showcase for the university's most promising graduates.

INFORMATION TECHNOLOGY bitdegree.ca

Carleton's School of Information Technology offers innovative programs with a strong combination of theoretical concepts and hands-on training that keeps pace with the ever-evolving high-tech industry.

You'll earn both a Bachelor of Information Technology (BIT) degree and a

Library and Information Technician diploma in the information resource management program, a BIT and an Advanced Diploma of Applied Art in the interactive multimedia and design program, or a BIT and Advanced Diploma in Technology for network technology or photonics and laser technology. All BIT programs offer co-op options with high placement rates. (All BIT programs are joint collaborations with Algonquin College.)

MEDIA PRODUCTION AND DESIGN carleton.ca/sjc/mediaproduction

Carleton's all-new Media Production and Design (MPD) program is offered jointly between the Faculty of Public Affairs' School of Journalism and Communication and the Faculty of Engineering and Design's School of Information Technology, providing students with diverse skills and experience.

A combination of intensive hands-on workshops and lecture courses provides students with a strong foundation in data, research, writing, and narrative abilities across media formats. As well as acquiring editorial and technical skills, students will develop theoretical knowledge and understanding of the power of storytelling through coursework in ethics, law and information technology theory. MPD students will also learn how to combine storytelling skills traditionally taught to journalists with the design skills that come from information technology, exploring where the two intersect to engage audiences in distinctive ways.



Your Carleton degree is:

- Well Recognized
- Innovative
- Hands-On
- In High Demand





The Carleton University Simulator Project, uniquely designed to rotate freely in any direction, will allow for the recreation of dangerous situations such as flight inversions or spins, which cannot be replicated by conventional pilot trainers.

Aerospace Engineering

In the 20th century, humans realized the age-old dream of flying. Today, the modern aerospace industry in Canada is vigorous, innovative and highly competitive.

Carleton University established the first Bachelor of Engineering degree program in aerospace engineering in Canada. Generating more than \$22 billion in annual revenue and employing more than 80,000 people, the Canadian aerospace industry has a worldwide reputation for leadership in fields including commuter and business aircraft, gas turbine power plants, aircraft simulators, communications satellites and guidance systems.

carleton.ca/mae

Your opportunities

- Specialize in aerodynamics, propulsion and vehicle performance; aerospace structures, systems and vehicle design; aerospace electronics and systems; or space systems design.
- Gain real experience through co-op work placements, a final-year design project that emulates a design office setting at an aerospace firm, and a program that emphasizes problem-solving skills and hands-on laboratory and design work.
- Access unparalleled laboratory and computer facilities, including atmospheric boundary-layer and supersonic wind tunnels; a large-scale water channel; model satellites; thermal and vibration testing of satellite sub-structures; structural testing of aircraft components; material processing equipment; equipment for the study of heat transfer phenomena; and training on avionics systems.

Soaring to New Heights



Carleton's Blackbird UAV (uninhabited aerial vehicle) team has been taking to the skies since 2009, developing and constructing fixed-wing UAVs for national competition. Comprised of over 30 students from a wide variety of engineering disciplines, including aerospace, communications and electrical engineering, the extracurricular group participates annually in the national Unmanned Aerial Systems Student Competition hosted by Unmanned Systems Canada. In 2016, Blackbird UAV

was awarded a special prize for innovation at the event, which challenges teams with diverse aerial scenarios and real-world applications.

You might also be interested in mechanical or computer systems engineering.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

- Develop contacts for future employment through Carleton's close association with government research organizations such as the National Research Council Canada and the Canadian Space Agency.

planning, with courses dedicated to orbital mechanics, spacecraft design, communication, propulsion and dynamics.

Your future

You will be prepared for a challenging career in the aerospace design and manufacturing industry, airline and space operations, government research laboratories, and aircraft certification and accident investigation authorities.

Your program

The program begins with a common set of courses in engineering and science to provide a foundation in the key disciplines of dynamics, thermofluids, solid mechanics and materials essential to the design of airframes, space platforms, propulsion systems and control systems. These are followed by specialized courses according to your stream:

- **aerodynamics, propulsion and vehicle performance** specializes in aircraft aerodynamics, performance, control and propulsion technologies;
- **aerospace structures, systems, and vehicle design** focuses on lightweight structures and materials for aircraft and spacecraft;
- **aerospace electronics and systems** concentrates on modern aircraft and spacecraft electronics for navigation, guidance, communication and remote sensing; and
- **space systems design** emphasizes spacecraft design and mission

- Progressive co-op education option
- Scholarships for high-standing students
- Accredited by the Canadian Engineering Accreditation Board



Aerospce Engineering graduate Quinn Murphy (BEng/10) is helping high-end electric automaker Tesla Inc. shift an industry towards sustainable transportation. Working as an aerodynamicist, Quinn focuses on shaping vehicle exteriors to eliminate inefficiencies and minimize air resistance - key factors in extending the range of electric vehicles.



Architectural Conservation and Sustainability Engineering students travelled to Ouarzazate, Morocco to perform an architectural survey of the Kasbah of Taourirt - a 1.6 hectare, four-level complex that is considered part of the country's national heritage. The architectural drawings prepared by the Carleton team are being used as part of a Getty Conservation Institute project to develop and apply a methodology for documentation, emergency stabilization and integrated conservation planning for the rehabilitation of earthen architecture settlements.

Architectural Conservation and Sustainability Engineering

Whether by designing new “green” buildings or retrofitting heritage properties, modern societies are demanding economic, social and environmental sustainability. By combining civil and environmental engineering and architectural studies, Carleton’s program—the first of its kind in Canada—is educating experts in sustainable green building design and heritage conservation.

Architectural conservation and sustainability engineers apply their knowledge in sustainability to the design and retrofit of new and existing buildings and structures, considering life-cycle costs, impacts of selected materials, and energy needs and consumption. They also bring their expertise to the burgeoning field of conservation, repairing and

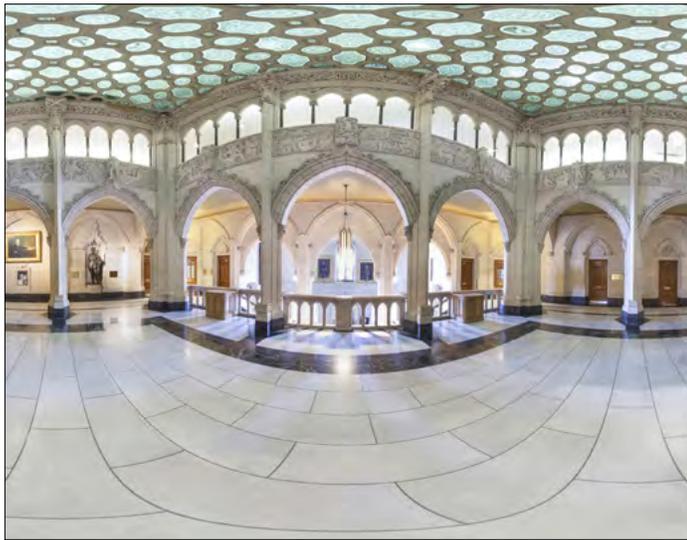
adapting structures with various levels of heritage designation.

Your opportunities

- Specialize in structural or environmental streams of study.
- Benefit from the multi-disciplinary program that draws on the resources of and collaboration with

a top-notch engineering faculty and renowned architecture program.

- Gain real experience by collaborating on projects with architecture students and through a challenging and hands-on final-year project that brings together your knowledge, skills and expertise.



Students involved with the Carleton Immersive Media Studio (CIMS) helped to develop a virtual tour of Canada's Senate by capturing and merging 360-degree photographs, laser scans and photogrammetry.

- Access computer rooms and engineering laboratories with state-of-the-art equipment including laser scanners to develop 3D images of heritage sites and a fully instrumented building to evaluate energy use.
- Develop contacts for future employment through Carleton's close association with advanced research institutions, such as the National Research Council Canada, Natural Resources Canada and Environment Canada, and key industry and government partners, such as the Heritage Conservation Directorate, Public Works and Government Services Canada, the Canada Green Building Council, and Canada Mortgage and Housing Corporation.

Your program

In the first two years, students in the **structural stream** and the **environmental stream** study a similar core of courses in engineering, math, science and introductory architecture. In the third and fourth years, students in both streams study green building design and rehabilitation of heritage buildings and complete a specialized design project.

As a structural stream student, you will concentrate on conservation and sustainability in the design of new structures and the assessment and retrofit of existing structures. You will complete the same structural design courses as a Civil Engineering student.

The environmental stream allows you to develop sustainable building practices with a focus on water quality and conservation, air quality, life-cycle analysis, and disposal of materials and waste streams.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

You might also be interested in civil engineering or environmental engineering.

- Progressive co-op education option
- Scholarships for high-standing students
- Option of a structural or environmental stream
- Accredited by the Canadian Engineering Accreditation Board

Students in both areas complete a specialized design project in their final year and also study green building design and rehabilitation of heritage buildings.

Your future

As a graduate in this field, you will have acquired a skill set that industry has identified as lacking in current post-secondary school education in Canada. Graduates from the Structural Stream will be able to design a building just like a structural or civil engineer and will benefit from

specific expertise in green building design and heritage conservation. Graduates from the Environmental Stream have a unique blend of expertise in water and air quality, waste and resource management complemented by sustainable building design and conservation.

You will be prepared to continue studies in graduate programs in conservation and sustainability or a professional designation as an architect through Carleton's Master of Architecture program.



Professor Stephen Fai, director of the Carleton Immersive Media Studio (CIMS), tests out a special interactive digital exhibit produced by him and his students as part of Canada's 150th anniversary celebration in Ottawa.



Fourth year Biomedical and Electrical Engineering students Maryam Kaka and Victoria Madge display their Integrated Concussion Assessment System (I-CAS) mobile application, which aims to migrate clinical concussion testing and recovery monitoring to the home environment. By assessing a specific brain signal through electroencephalography (EEG), tracking eye gaze, testing patient balance and integrating the combined results with the Sport Concussion Assessment Tool 3 (SCAT3) questionnaire, I-CAS helps to track and monitor concussion recovery in an objective and comprehensive manner.

Biomedical and Electrical Engineering

Increasingly, the field of health care relies on technology. Biological signals, such as those from the heart and brain, are routinely used for both diagnostic and therapeutic purposes. Computer tools are used to collect and analyze data, such as gene sequence databases that contain millions of entries.

Sensors, actuators and electronics make medical devices work—and can even be used to deliver drugs inside the human body. Advances in medical imaging techniques such as MRI and PET scans lead to the early diagnosis, and better treatment and

prevention, of disease. Medical informatics, telemedicine and electronic health records help improve the delivery of health care.

Biomedical and electrical engineering is a fast-growing field that uses technology to design and build new

components and systems for biomedical solutions to problems in medicine and biology.

Your opportunities

- Focus on bioinformatics, bio-signal processing, information technology

in biomedicine, micro-technology for sensors and micro-electro-mechanical systems (MEMS), instruments and measurements, and cardiovascular devices.

- Access state-of-the-art biomedical research facilities, including a biological signals laboratory and medical imaging laboratory, telemedicine and tele-operations facilities, a superb undergraduate computing network, portable biological signal acquisition equipment, and prototyping workstations; and laboratories sponsored by companies such as Alcatel, Texas Instruments and Mitel.
- Develop contacts for future employment through Carleton's close association and collaboration with prominent professors from the medical field and local hospitals, such as the Children's Hospital of Eastern Ontario and the University of Ottawa Heart Institute, among other health care establishments.

Your program

Learn the fundamentals of science and mathematics, including biology, chemistry and physics in first year. Second year introduces



Biomedical students are developing new algorithms to assess asthma and obstructed breathing and comparing them to existing methods. Here, a spirometer measures the volume of air breathed in and out, while the sealed plethysmograph chamber detects changes in pressure to monitor lung volume and effort.

courses in electronic circuit design, numerical analysis and programming. In third year, specialize in digital and analog circuit design, semiconductor device physics, electromagnetics and bioelectrical and biomedical systems. Senior courses involve advanced study in biomedical engineering, including signal processing and medical instrumentation, with opportunities to apply your knowledge to the biomedical and health care fields. You will gain hands-on practice through supervised project work, extensive

laboratory and clinical field experience, and oral and written presentations.

Your future

You can find employment in health-care establishments and medical facilities, working with computers, medical equipment or medical devices or developing health care technologies such as electronic implants, safer medical materials and devices, or superior data management and diagnostic systems. You will be well prepared for continued studies at the graduate level or in medicine.

You might also be interested in electrical engineering or computer systems engineering.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

- Progressive co-op education option
- Scholarships for high-standing students
- Accredited by the Canadian Engineering Accreditation Board
- Designed to meet prerequisite courses for many medical schools in North America

Developing Medical Innovations



Students in the Biomedical and Electrical Engineering program have the opportunity to work on exciting medical innovations. Recent graduate of the program Greg Kiar devoted his Capstone 4th Year Project towards *Human Central Nervous System Augmentation*.

Working with a team of students, Greg developed a rehabilitation device for stroke victims which stimulates damaged muscle tissue in order to strengthen deteriorated neural pathways.

Since graduating from the program, Greg now develops software tools that enable neuroscientists to map pathways in the human brain and is currently pursuing graduate studies at Johns Hopkins University in Baltimore.



Biomedical and Mechanical Engineering student Johana Forero Rondon aligns a calf femur in a servo-hydraulic testing machine to assess its fracture strength.

Biomedical and Mechanical Engineering

Biomedical engineers apply engineering principles to aspects of medicine to improve healthcare diagnosis, monitoring and therapy. They help create prostheses, artificial organs, drug delivery systems and a range of surgical and life-support systems. By combining a foundation of mechanical engineering with the rapidly growing discipline of biomedical engineering, biomedical and mechanical engineers analyze and solve problems related to biomechanical engineering, biotechnology and medicine.

Your opportunities

- Access well-equipped laboratories and computer facilities for experiments and design projects that emphasize problem-

olving skills and hands-on experience with artificial devices for bone repair or replacement, mock cardiovascular systems, biomaterial testing, and gait measurement.

- Develop contacts for future employment through Carleton's close association and collaboration with medical researchers and local hospitals, biotechnology firms,



Carleton graduate student Andrew Geddes developed a device to measure the position and force of a doctor's fingertips during abdominal examinations.

▼
You might also be interested in biomedical and electrical engineering.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

research institutions and government agencies and departments.

- Benefit from an interdisciplinary academic approach and opportunities to work with, and learn from, students in other engineering programs.

Your program

In your first year, you will learn the fundamentals of basic science and mathematics, with courses in biology, chemistry and physics. Second year offers introductory courses in fluid mechanics, solid mechanics, thermodynamics, materials and biochemistry. In third year, specialized biomechanical courses dealing with biofluids and biomaterials are offered along with mechanical engineering design courses and organic chemistry. Fourth year allows you to further specialize in biomechanics and biomechanical device design. You will participate in a major biomedical capstone design project that further develops your quantitative and experimental skills in a

team setting and provides outstanding practical experience.

Your future

With well-rounded training in mechanical engineering with a focus on biomedical applications, you will be qualified to work in the fields of medical devices, biomedical engineering,

health services, diagnostic equipment, medical instruments and medical information systems. These industries are growing, in Canada and globally, and the demand for specialists is expected to increase. You will be well prepared for continued studies at the graduate level or at a medical school.

- Progressive co-op education option
- Scholarships for high-standing students
- Accredited by the Canadian Engineering Accreditation Board
- Designed to meet prerequisite courses for many medical schools in North America



The Carleton University Crash Dummy (CUCD) fourth year project has students design and build a crash dummy and subject it to various collision scenarios. With sensing capabilities beyond those of commercially available crash test dummies, CUCD can predict a wider range of injuries, enabling the simulation and analysis of accidents such as automotive, bicycle, low-impact and high-impact falls, and sports impacts such as hockey cross-checks and football head-on collisions.



Professor David Lau's research involves the monitoring and assessment of large structures, including the Confederation Bridge. He uses data collected from more than 750 sensors built into the 12.9-kilometre bridge connecting Prince Edward Island and New Brunswick to track the structure's behaviour under ice forces, wind, earthquake, deformations, thermal stresses, corrosion and load.

Civil Engineering

Everything in our built environment—from towers reaching to the sky, to bridges spanning provinces, to dams holding back rivers—is the work of civil engineers who plan, design, build, maintain, rehabilitate and manage the infrastructure that houses people, moves goods and supplies power and water. Whether working on one-of-a-kind structures or the roads we drive every day, civil engineers make meaningful contributions to the development, evolution and safety of our physical world.

Your opportunities

- Explore structural, geo-technical and transportation engineering with a program of study that emphasizes problem-solving skills, laboratory experience, design and advanced computer methods for civil engineering.
- Access to excellent computer facilities and laboratories, such as a materials lab to assess properties of steel, concrete or soil, and a state-of-the-art strong floor facility for the testing of large-scale specimens.
- Develop contacts for future employment and access



Civil engineering students showcase their entry for the annual Troitsky Bridge Building Competition at Concordia University in Montreal. Competitors use their skill and imagination to construct bridges from dental floss, popsicle sticks and glue. Entries are judged on aesthetics, originality, presentation and strength – some bridges can support a load of more than 2,300 kg.

additional research and resource facilities through collaborative design projects with industry, government and other research agencies in the Ottawa region, including the National Research Council Canada.

Your program

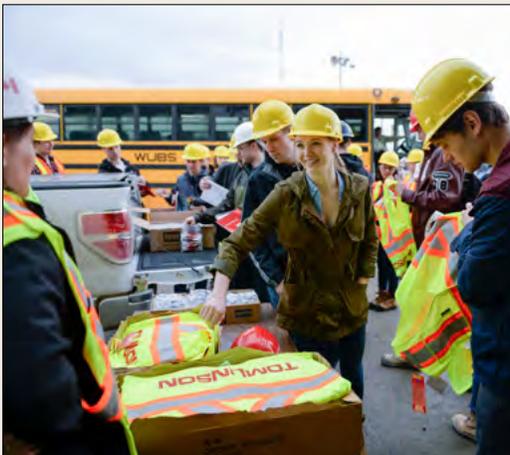
You will develop a broad background in engineering in your first two years of study before specializing in:

- structural engineering—the construction and functioning of safe, reliable buildings and bridges, as well as the analysis and assessment of existing structures;
- transportation engineering—the planning and design of safer systems and facilities for traveling and transportation on land, by water or in the air;
- geotechnical engineering—the evaluation of subsurface soil and rock as building foundations or as the framework for structures such as tunnels and mines; or
- municipal engineering—the range of tasks handled by municipal governments, such as road or bridge maintenance, water and waste water treatment, waste management and urban planning.

Your future

You will be a highly skilled professional with the expertise in analysis, computer applications and design that is in demand from government and consulting engineering firms. You can plan and execute technically advanced civil engineering projects such as building and bridge construction, design and construction of runways and seaports, energy resource development and engineering for cold climates.

Experience Industry



Student Experience and Engagement Engineering Tours provide Carleton engineering students with the opportunity to experience industry in an on-site setting.

In April 2016, civil engineering and environmental engineering students visited the TOMLINSON Group, where they were given the opportunity to engage with engineers in the field while touring TOMLINSON's facilities, including their aggregate operations and rock crushers, their asphalt plant, their material testing labs and their waste management facilities.



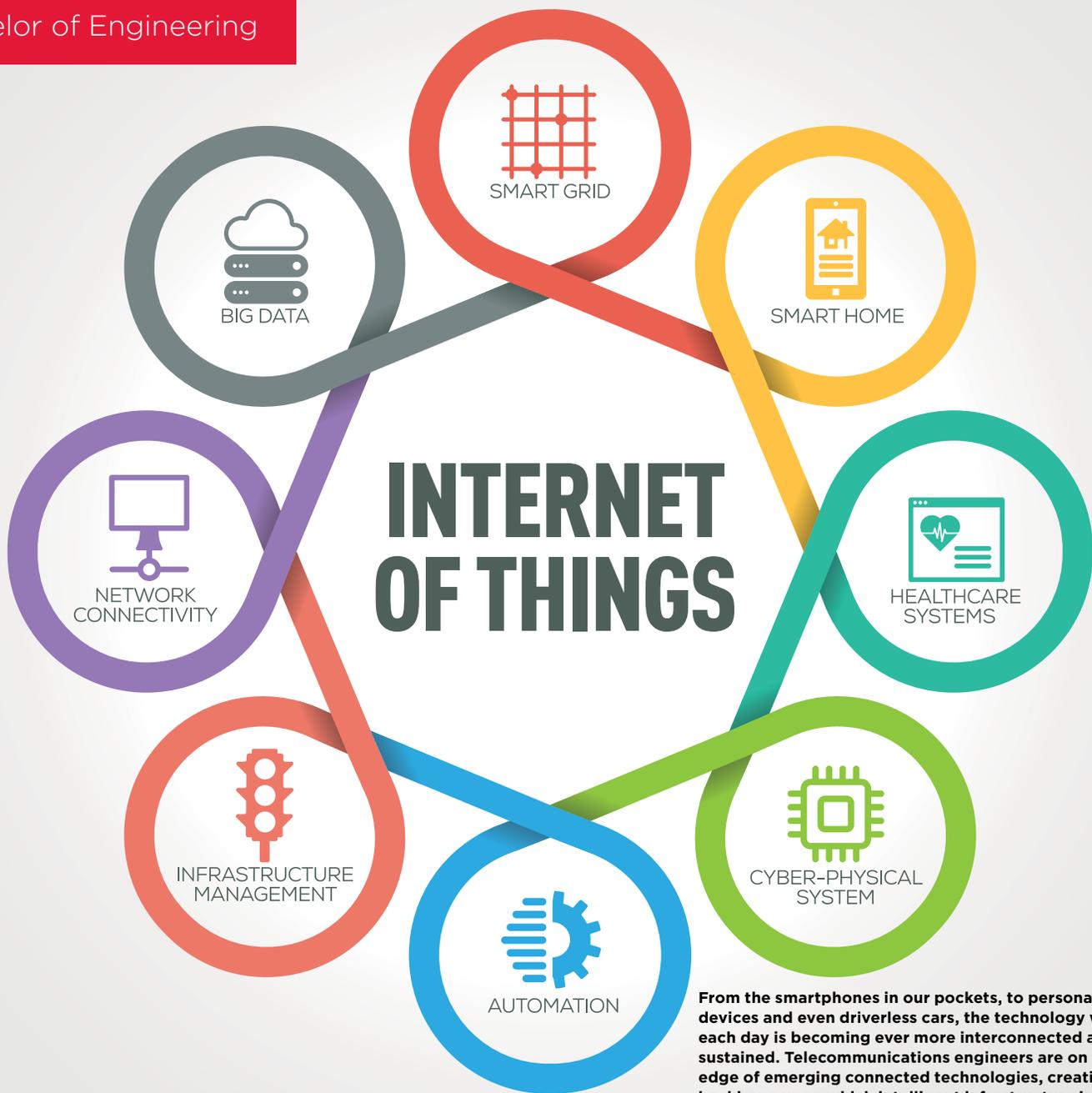
You might also be interested in architectural conservation and sustainability.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

- Progressive co-op education option
- Scholarships for high-standing students
- Accredited by the Canadian Engineering Accreditation Board

THE CAPITAL ADVANTAGE

The National Research Council Canada (NRC) is the country's scientific and industrial research agency. Based in Ottawa, the NRC helps turn ideas and knowledge into new products, processes and services. Outstanding government scientists and engineers work directly with partners from Carleton University and from industry. These collaborations mean that Carleton students enjoy access to the latest technology and research, especially in the areas of aerospace, hydraulics, information technology, transportation and micro-structural sciences.



Communications Engineering

Telecommunications engineers play an integral role in developing the world as we know it. They are the architects of cloud computing, satellites, smart phones, internet applications, social networking technologies, wireless systems, and integrated voice, data and video communications.

Telecommunications experts have engineered the ever-present interconnectivity of our devices, vehicles and city infrastructure, permitting our everyday lives to be enhanced by the internet of everything. They are responsible for

designing, building and operating the robust telecommunications and related distributed information systems that have permeated our culture and determined the future of business and entertainment.

Your opportunities

- Gain real world experience through co-op work placements, a final-year design project and integrated studies in the

principles and practice of telecommunications and related computer technologies.

- Access state-of-the-art laboratories and facilities sponsored by Alcatel, Texas Instruments, Huawei and TELUS for design work that emphasizes problem-solving skills and hands-on experience.
- Develop key contacts for future employment through Carleton's close association with laboratories of the federal Communications Research Centre, the National Research Council Canada and many technology companies located in the national capital.
- Learn from university, industry and government lecturers who are telecommunications experts.

Your program

You will gain a broad foundation in the basics of mathematics, physical sciences, and engineering sciences and technology. You will also develop a strong background in real-time computer systems and software engineering through the study of communications theory and



practice, design and analysis of telecommunications components, systems, software, applications, and regulatory and social issues. The program provides you with the flexibility required to practice in a world of rapidly changing technology, alongside the specific knowledge and skills that are highly valued by employers in the telecommunications and information industries.

Your future

As a graduate of the communications engineering program, you will be well equipped for a myriad of positions that are in high demand. Within the telecommunications industry, you can find yourself in research and development,

manufacturing, installation, operational maintenance, protocols and new services testing.

For the computer industry, you will have the tools to engineer telecommunications products, distributed computer networks and multimedia systems, as well as the knowledge to interface them with telecommunications facilities.

Telecommunications engineers are also essential to the financial, transportation, hospitality and defence industries, government research and development laboratories, regulatory and licensing agencies, standards organizations and telecommunications service providers.



You might also be interested in software engineering or computer systems engineering.

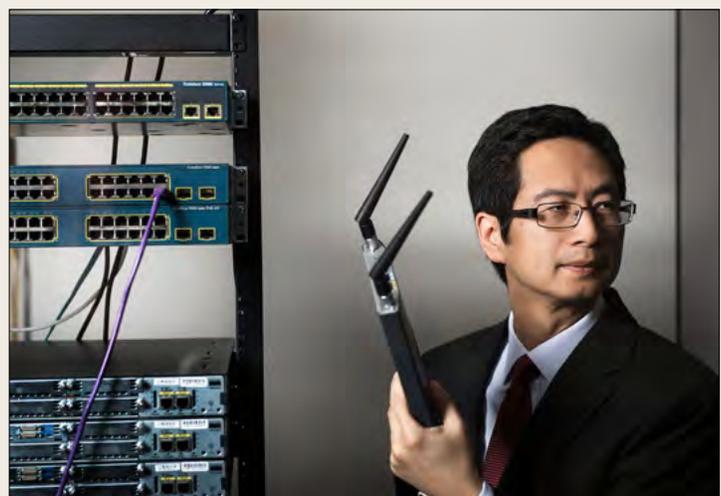
Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

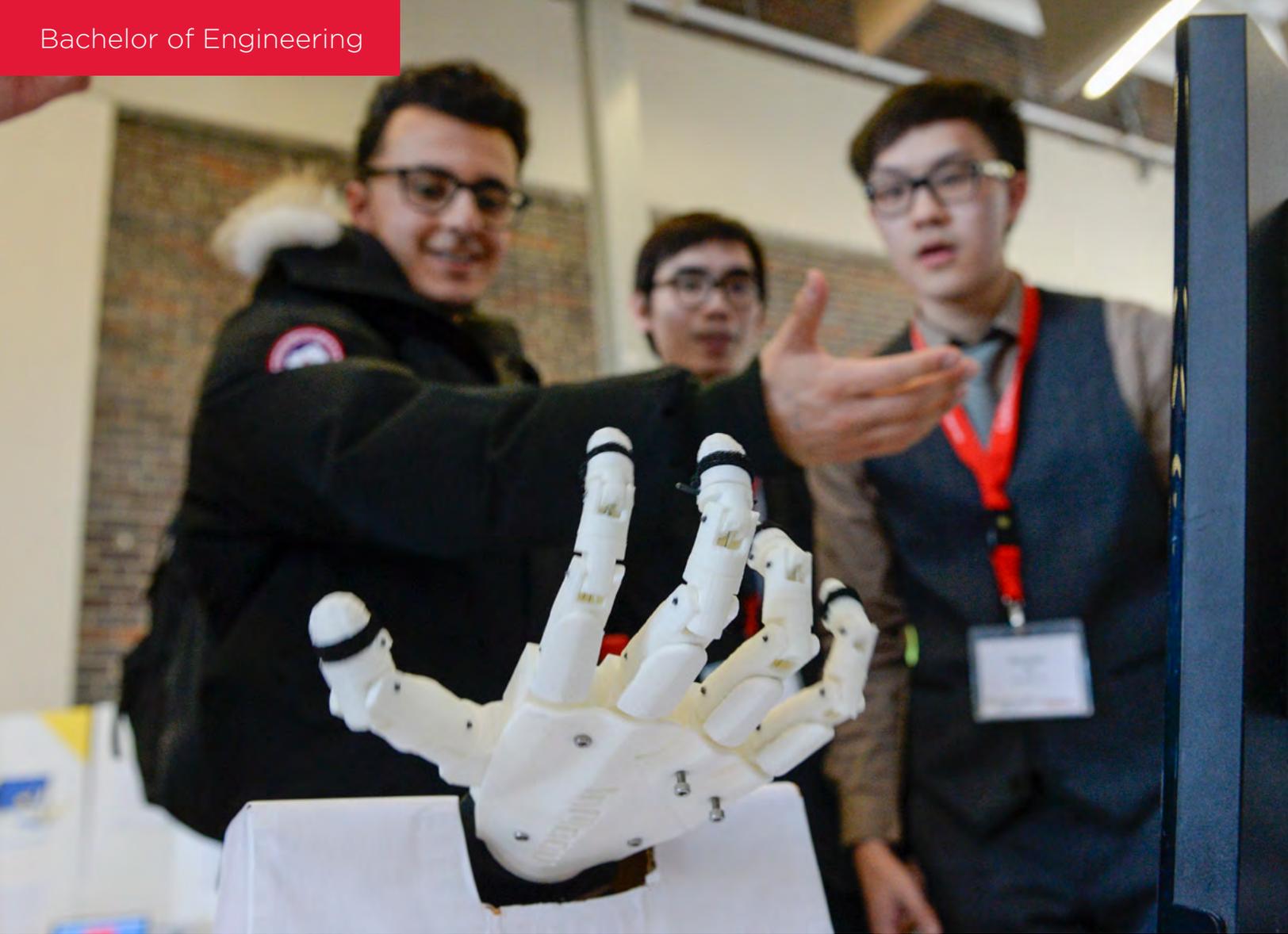
- Progressive co-op education option
- Scholarships for high-standing students
- Accredited by the Canadian Engineering Accreditation Board

The Future of 5G Wireless

Leading innovator and professor in Carleton's School of Information Technology, Richard Yu, has dedicated his career to improving the efficiency and effectiveness of wireless cellular networks. Specializing in diverse aspects of network development, his research is being used to help deploy the ultra-high-speed 5G wireless networks that will power the Internet of Things (IoT), connected and autonomous vehicles and more.

Having recently received \$600,000 from the Natural Sciences and Engineering Research Council (NSERC) through a Strategic Partnership Grant, Yu seeks to enhance 5G communication networks, which are up to 100 times faster than current 4G or LTE networks. He also looks to improve 5G integration into new and emerging technologies as more devices become connected to the internet.





A visitor at the Faculty of Engineering and Design's annual Innovation Expo tests out a prosthetic hand controller with gesture recognition and enhanced coordination, developed by fourth year Computer Systems Engineering students as part of a multi-year Capstone design project.

Computer Systems Engineering

Computer systems, particularly embedded microcontrollers and digital signal processors and related hardware, have become essential components in almost every area of modern life, from telecommunications and information networks to multimedia applications and real-time control systems, and from aerospace and satellite systems to mechatronics and autonomous vehicles.

Computer systems engineers design complex computer systems—such as smart phones and communication networks, intelligent cars and smart highways—that can interact with one another to solve problems or improve

productivity and keep us connected to the world around us.

Your opportunities

- Integrate studies in computer systems organization, software engineering, real-time

systems, electronics, computer networking and general systems design.

- Engage in lab and design projects that emphasize problem-solving skills and hands-on experience in real-time systems or computer

Control in Real-Time



Carleton students at the Advanced Real-Time Simulation Lab have been working on an improved method that will allow smart devices, cars and drones to be brought to life easily and quickly.

Students are using a new technique to develop controllers for software systems embedded in hardware platforms, such as robots and drones, in order to improve response time and efficiency.

They are currently applying their new approach to a miniature self-driving car and a radio-controlled quadcopter among other smart devices.

architecture in laboratories sponsored by Alcatel, Texas Instruments, Huawei and TELUS.

- Develop contacts for future employment through Carleton's close association with the laboratories of the Communications Research Centre, the National Research Council Canada and the local technology companies that make Ottawa a hub of high-technology. Companies and organizations tap into Carleton as a rich source of talent, ideas and expertise for research partnerships and future employees.

Your program

You will acquire a broad base of knowledge in science, mathematics, computers, and engineering science and design in first year. Over the next three years of the program, you will learn to engineer computer systems and acquire a deep understanding of computers as integrated software/hardware systems. You will become adept in object-oriented programming, real-time systems, software engineering, digital and analog electronics, linear systems, communications systems and networks, and telecommunications.

Specialized topics (such as a focus on robotics or artificial intelligence) and an advanced research project round out the program.

Your future

As a computer systems engineer, you will work at the interface of hardware and software—and be able to design both—especially in the area of embedded and autonomous systems, microcontroller applications, telecommunications, and the engineering of computer-based systems. Graduates of

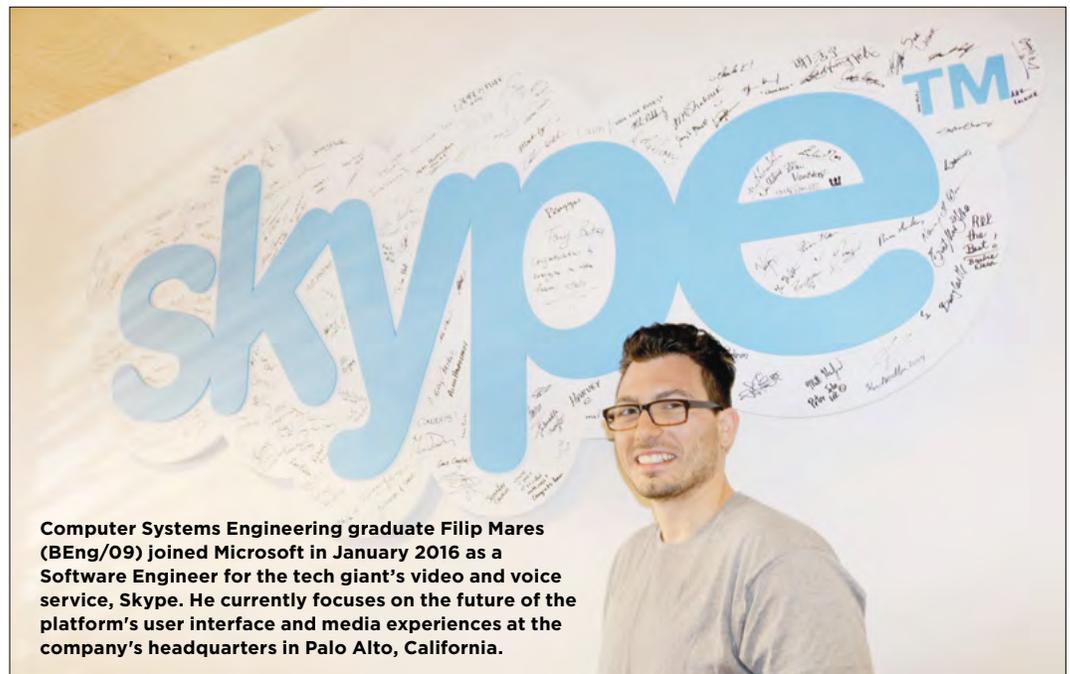
the program are the founders of, and active leaders in, several high-tech companies specializing in computer systems and information networks.

Canada's computer-based systems industry is a contributor to the economy and is recognized worldwide for its technical and commercial success. Challenging career opportunities continue to be created as computer systems are integrated in new products and processes.

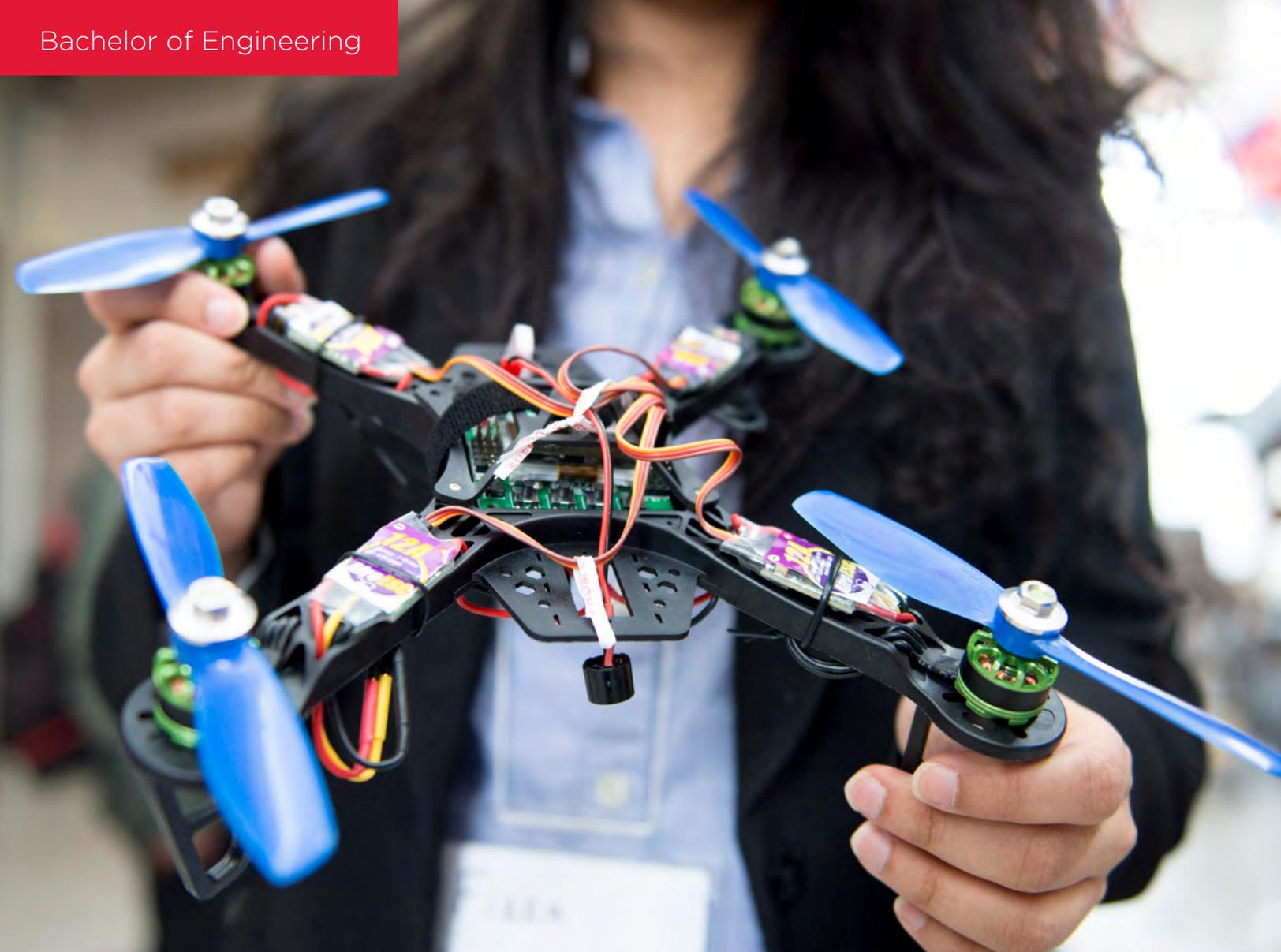
You might also be interested in software or communications engineering.

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Computer Systems Engineering graduate Filip Mares (BEng/09) joined Microsoft in January 2016 as a Software Engineer for the tech giant's video and voice service, Skype. He currently focuses on the future of the platform's user interface and media experiences at the company's headquarters in Palo Alto, California.



Electrical Engineering student Fizza Ahmad Sheikh and her fourth year Capstone team developed the First In Risk Evaluation (FIRE) System to help improve the safety of firefighting operations. By piloting a drone equipped with thermal imaging cameras, firefighters are able to measure heat intensity and identify structural dangers through a specialized graphic user interface.

Electrical Engineering

Electrical engineers are transforming civilization and society. Working in industry, government and academia, they create the light we read by, the devices we use to play our music, and the computers on which we work, game and socialize.

This revolution in lifestyle is achieved through the design of the largest and the smallest structures ever built by humans. Working with nano-scale devices smaller than most living cells, electrical engineers design the microchips used in larger

devices from cellphones to satellites and supercomputers. This vast array of networked devices is powered by the largest man-made structure in the world: a massive grid, designed by electrical engineers, moves energy all over the world, creating light

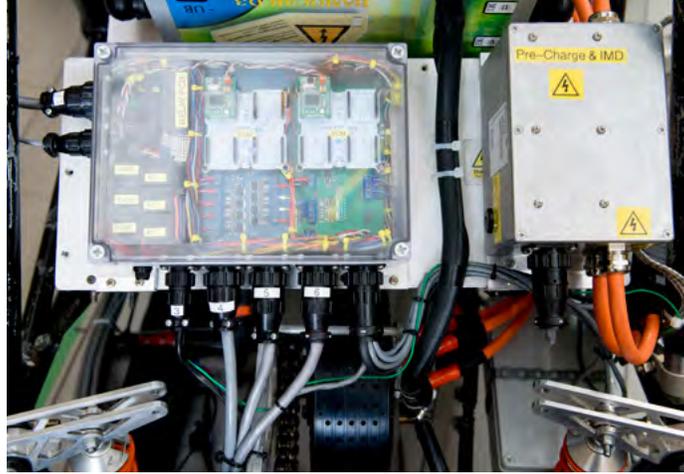
and heat, transporting people, irrigating land and powering phones and computers.

Your opportunities

- Specialize in wireless electronics, integrated circuit design and fabrication, nanotechnology,

green energy, biomedical sensors and technologies, antennas, light-wave devices, aerospace electronics, or design automation.

- Design your own integrated circuits in Carleton's on-campus fabrication facility—one of the few such facilities at a Canadian university.
- Access a superb undergraduate computing network with state-of-the-art workstations and computer-aided design tools in modern, well-equipped laboratories.
- Develop contacts for future employment through Carleton's close association with the largest government electrical engineering laboratories in Canada (including the Communications Research Centre Canada and the National Research Council Canada) and access to Ottawa's concentration of telecommunications and high-tech companies and leading hospital and medical research facilities, such as the University of Ottawa Heart Institute and the Children's Hospital of Eastern Ontario.



In addition to developing internal combustion powered vehicles, Carleton's Ravens Racing team designs and constructs both hybrid and fully electric powered racers for international competition.

Your program

The first year of the Bachelor of Engineering program in electrical engineering emphasizes fundamentals in math and science. Second year introduces you to network analysis, electronic circuit design, object-oriented programming and numerical analysis, while continuing to develop a strong base of math and computer skills. Third year courses provide specialization in digital and analog circuit design, semiconductor device physics, electromagnetics and real-time programming.

Fourth year offers options for further development in areas

such as wireless electronics, antennas, integrated circuit design, layout and fabrication, fibre optic communications, nano-electronics, sensors and sensing technology, solar cell/photovoltaic technology, power systems, aerospace electronics and computer-aided design for electronics engineering. A capstone project lets you apply your knowledge in a hands-on group research project.

Your future

You can find employment with companies developing products and services in wireless electronics, biomedical electronics,

You might also be interested in biomedical and electrical engineering or engineering physics.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

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instrumentation, mobile electronics, electrical power and smart grids, renewable energy systems, computer/game hardware, telecommunications and aerospace electronics.

Electrifying Career Development

During her third year at Carleton, electrical engineering student Ann Gunaratnam was awarded the Hydro One Women in Engineering Scholarship. The award is presented annually to women studying engineering who demonstrate strong communications skills, an impressive grade point average (GPA) and community engagement within their field through outreach, volunteer or educational activities with younger girls. The scholarship included a prize of \$5,000 and a paid developmental work term with Hydro One.

"Being named as one of the recipients of the Women in Engineering Scholarship was such an exciting milestone for me," explains Gunaratnam. "The work term that accompanied the scholarship has been one of the most eye opening experiences I've had. It's provided me with first-hand experience and training in the power industry, an area I am very passionate about."

Gunaratnam has been involved with Engineers Without Borders and has acted as a peer mentor for first-year students. Before completing her co-op placement at Hydro One, she previously interned at Carleton's Department of Electronics and the National Research Council's Flight Research Laboratory.





A Carleton student examines a silicon wafer in our on-campus clean room, a microfabrication laboratory that facilitates integrated circuit design and testing.

Engineering Physics

A challenging and elite field that combines the strengths of physics and engineering, engineering physics applies fundamental physical science to the solution of technological problems and the development of new technology. Engineering physicists use a broad foundation in material science, applied physics, electronics and nanotechnology to develop new semiconductor devices, optical systems and nano-scale integrated devices for telecommunication, biomedical and renewable energy applications.

Your opportunities

- Specialize in integrated semiconductor devices and technology or optical devices and systems.
- Design your own integrated circuits in Carleton's on-campus fabrication facility—one of the few such facilities at a Canadian university.
- Gain real experience collaborating with a senior professor on a team project to design and implement an optical system—a unique experience in first year.



Engineering Physics students have access to a wide variety of electronics labs and facilities on campus.

- Access superb computer networks and resources and modern, well-equipped laboratories such as the Canadian Photonics Fabrication Centre for the design, fabrication and testing of state-of-the-art photonics and optoelectronics components and systems.
- Develop contacts for future employment through Carleton's close association with Ottawa high-tech companies and the laboratories of the National Research Council Canada and the Communications Research Centre.

Your program

Your program begins with a broad and fundamental background in physics and electronics. During the first year, you have a unique opportunity to participate in a small class and collaborate closely with a senior professor on a team project to introduce you to engineering design early in your studies and make your subsequent years more relevant and interesting.

The second and third years of the program provide you with a strong background in physics and engineering, with courses in programming, electronics and modern physics. Fourth

year allows you to specialize in either semiconductor device technology or applied optics. Electives are also available in integrated-circuit (IC) design, telecommunications electronics, computer-aided design, microwave engineering, integrated sensors and other areas.

Your future

As an engineering physicist, you will be well equipped to work in the renewable energy and telecommunications high-technology sectors including IC fabrication, microelectronic devices, nanotechnology, microwave

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You might also be interested in electrical engineering or photonics and laser technology.

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and optical systems, and sensor technology.

Some engineering physicists build careers in biomedical engineering and medical physics. This degree prepares you for graduate studies in electrical engineering or physics.

Finding Big Solutions with Tiny Tech

Using silicon chips and photonics to detect and treat infectious diseases, Professor Winnie Ye is developing tomorrow's health and medical technologies today. Dr. Ye is a Carleton University graduate (BEng/00, PhD/07) who holds the Canada Research Chair in nano-scale IC design for reliable optoelectronics and sensors.

She makes Carleton her research home for some of the same reasons engineering and design students do: the university's partnerships with neighbouring technology companies and government institutions committed to advancing R&D, and one of the only campus clean rooms in Canada, which gives students firsthand experience in learning to fabricate semiconductor devices for biomedical, telecommunication and renewable energy applications.





Environmental Engineering undergrad Jordan Gerber helped to develop storm water management solutions for Carleton's campus as part of his co-op placement with WSP, one of the world's leading engineering professional services consulting firms.

Environmental Engineering

Environmental engineers ensure that we have clean water to drink, clean air to breathe, clean soil in which to grow crops, and clean energy to sustain our growth. From global challenges like climate change to local issues such as a safe and secure supply of drinking water, the goal of environmental engineering is to offer sustainable and green solutions, and to provide a clean and healthy environment.

By using engineering and science principles, environmental engineers design innovative treatment technologies to minimize our environmental footprint, develop clean energy sources and protect our ecosystem, resources and public health.

Your opportunities

- Gain real experience through co-op work placements, a challenging final-year design project, and courses that emphasize problem-solving skills and hands-on laboratory work.
- Access modern computer facilities and well-equipped laboratories that allow students, for example, to analyze the water quality of the Rideau River that flows past campus or assess the air quality in a classroom or bus stop on campus.



Environmental Engineering students simulate the flow of contaminants as they move through a water system, assessing the dilution and dissemination of pollutants in order to develop clean water solutions.

- Develop contacts for future employment by participating in collaborative design projects with industry, government and research agencies in the Ottawa region and through Carleton's close association with the laboratories of Environment Canada, Health Canada and Natural Resources Canada.

Your program

One of only a few such programs in Canada, Carleton's program covers a range of topics from life-cycle

analysis and environmental impact assessment to the design process in four broad areas: air pollution control; groundwater flow and contaminant transport; solid and hazardous waste management; and water and waste water treatment.

The program mixes fundamental concepts and theory with analysis and design. In first year, you study common core courses. In the second year, you begin program-specific courses and take additional courses in

biology and chemistry. Third year teaches the unifying fundamental principles for the four areas outlined above. Fourth-year courses are applied and provide in-depth study and design in these areas.

Your future

As an environmental engineer, you will find employment opportunities in industry, municipalities, consulting firms, federal and provincial regulatory agencies, and research establishments. Your many career options

You might also be interested in sustainable and renewable energy engineering.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

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include designing treatment technologies and facilities, developing clean energy alternatives, providing safe drinking water, improving air quality and assessing waste management strategies.

Interdisciplinary and International Experiences

An interdisciplinary group of students and professors from Carleton's Faculty of Engineering and Design and Sprott School of Business recently completed a site visit to Longido, Tanzania as part of their final year Capstone project. Commonly known as From Buckets to Rain Barrels, the project involves a multi-year, multi-discipline team aimed at addressing chronic water shortage issues within the rural community.

After developing their prototypes over a four-month period, students were given the opportunity to bring them to Tanzania for site-specific testing and feedback from members of the community. Recent additions and enhancements to the project include a small scale solar still design, the introduction of drip irrigation as a water saving measure, improvements to brick making, a ceramic filter for water treatment, and the development of a local weather app for the community.





At the 2017 Ottawa Gatineau International Auto Show, Carleton's Ravens Racing team unveiled its all-new racer, set to compete against hundreds of teams from around the world in the international Formula SAE series. Designed and constructed by a team of students from a variety of engineering disciplines and powered by a 50 horsepower engine, the Formula SAE vehicle can reach speeds of 120 km/h and accelerate from 0 to 100 in 4.5 seconds.

Mechanical Engineering

Almost anything that is built to move can be considered mechanical. Mechanical engineers use their understanding of science and engineering to analyze, design, manufacture and maintain mechanical systems in vehicles, aircraft, heating and cooling systems, manufacturing, energy plants, machinery, medical devices and terrestrial and extraterrestrial exploration.

One of the most versatile of the engineering disciplines, mechanical engineering opens the door to a vast range of career possibilities.

Your opportunities

- Gain real experience through challenging laboratory and design work, including a final-year design project, that emphasizes

problem-solving skills, hands-on experience, and adaptation to changing technologies.

- Access outstanding computer facilities and



You might also be interested in biomedical and mechanical engineering.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

Carleton's Mechanical Engineering program provides students with a broad understanding of fundamental engineering concepts and emphasizes hands-on experience through challenging laboratory and design work.

campus laboratories, including wind tunnels, equipment for structural tests, facilities for material testing, laboratories to study thermodynamic and heat transfer phenomena, and fully equipped computer-aided design and prototype fabrication and testing facilities.

- Develop contacts for future employment through Carleton's close association and collaboration with National Research Council Canada laboratories and research institutes in the Ottawa region.

Your program

Your comprehensive study in one of Canada's largest mechanical engineering departments begins with the fundamentals of design and engineering sciences in dynamics, thermodynamics, solid mechanics, materials, fluid mechanics, heat transfer and control systems and robotics. Elective courses are available in noise control, energy conversion and power generation, manufacturing and production processes, aerodynamics and flight mechanics, vehicle engineering, spacecraft

design, propulsion and biomedical engineering.

Your future

You will be able to adapt to changing technologies and work effectively in interdisciplinary team settings. Employment possibilities are broad, with challenging and rewarding opportunities in the manufacturing industry, energy utilities, industry and government laboratories, building services and plant engineering, the transportation industry and a variety of consulting engineering firms.

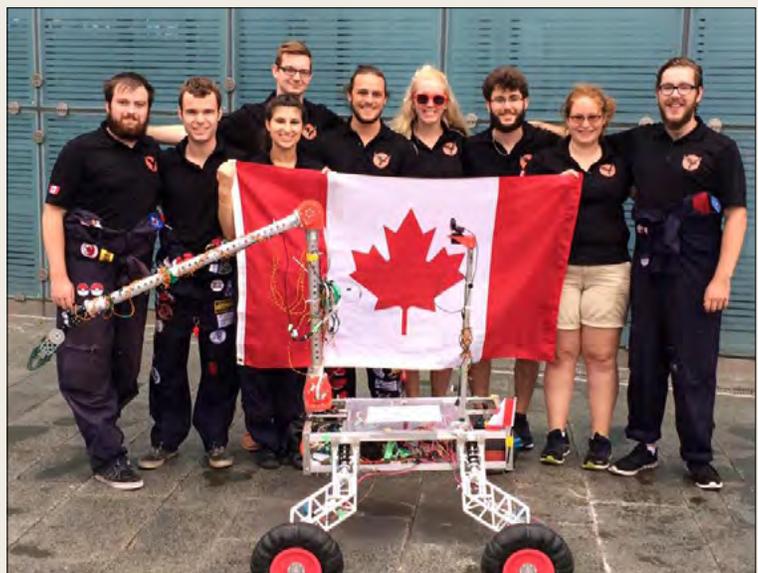
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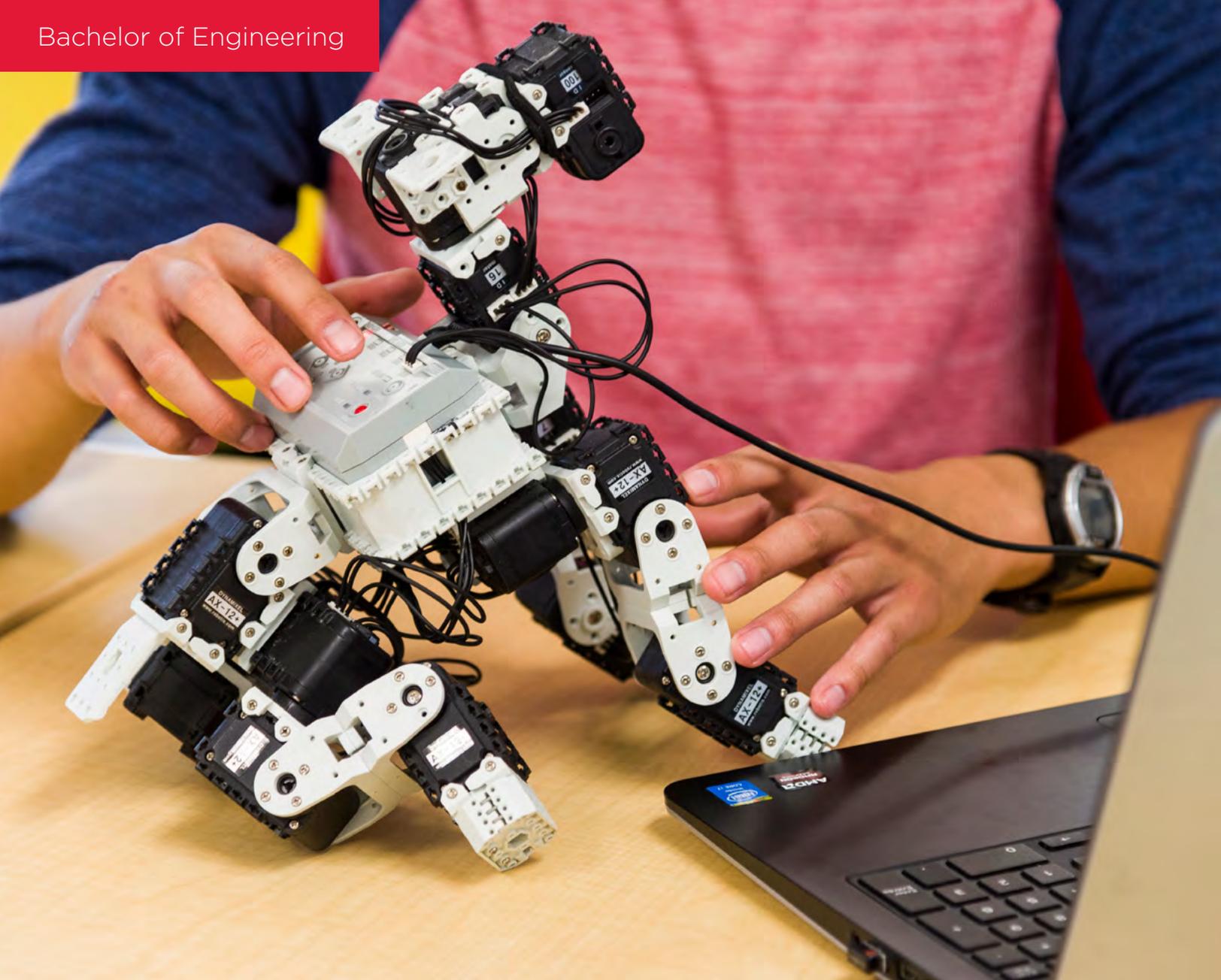
Out of this World

It was one giant leap for Carleton's Planetary Robotics Team as they travelled to the 2016 United Kingdom University Rover Challenge in Manchester, hosted by the United Kingdom Mars Society.

Nine Carleton undergraduate engineering students took part in the competition, securing a fourth place finish among teams from universities across the world, including entrants from the UK, Egypt, India and Poland.

As part of the competition, the team's self-designed, programmed and constructed rover was remotely piloted across specialized terrain intended to replicate conditions on Mars. The rover completed tasks such as navigating through gates and over obstacles and collecting soil samples for remote analysis.





Software Engineering and Computer Systems Engineering students are developing a robotic guide dog, fully equipped with a speech recognition system, to help assist people with disabilities.

Software Engineering

The phenomenal growth in computing, and the related information technology industry, has resulted in a tremendous demand for software engineers—people who are qualified to develop reliable, economical and high-quality software systems that provide the “brains” for hardware and bring to life the modern computer infrastructure that affects all aspects of our lives.

Much more than computer programming, software engineering offers comprehensive study in software security, reliability and quality, and creative solutions to meet the

requirements of end-users. Software engineers help software to evolve, add new features and merge isolated software systems into cooperating systems in industries such as aircraft,

satellite and air traffic control, banking, medical and imaging devices, e-commerce, web and portable applications and gaming.

Great Grad - John Duff, Director of Engineering, Shopify



You might also be interested in computer systems engineering.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.



John Duff graduated from the Software Engineering program at Carleton in 2006. He is now the Director of Engineering at Shopify, having helped to grow the Ottawa based company into the success it is today.

John credits his experience at Carleton in having helped to develop his technical knowledge and expand his ability to explore new problems and technologies. He also highlights meeting amazing people at Carleton, emphasizing the importance of having an opportunity to gain experience working in a team setting.

Your opportunities

- Learn essential discipline components such as programming paradigms and design notations through integrated studies in the principles and practice of software systems development and related computer technologies.
- Access well-equipped laboratories and computer facilities for lab and design work that emphasizes problem-solving skills and hands-on experience, such as state-of-the-art software modeling and engineering techniques.
- Develop contacts for future employment through Carleton's close association with government-led laboratories, the National Research Council Canada and many local technology companies such as IBM and Ericsson.

Your program

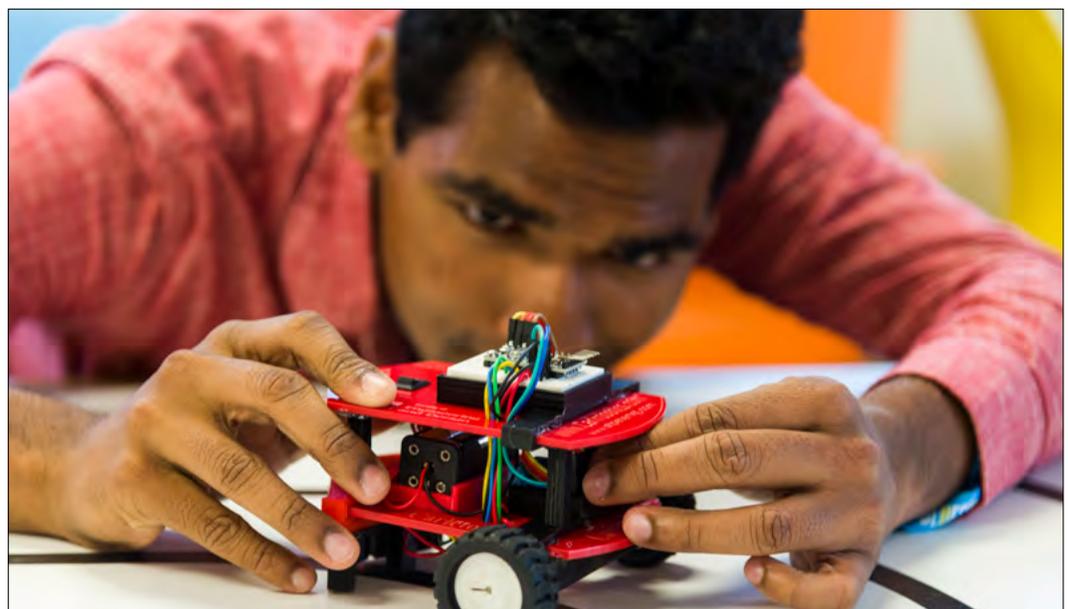
You will learn fundamental computing theory and practice; processes, methods and tools for developing software systems; and regulatory and social aspects of development. You will acquire a solid foundation in mathematics, physical sciences, engineering principles and design. You will learn to design software rapidly—while maintaining

the flexibility needed to accommodate future changes—and become increasingly specialized in object-oriented modeling (using the standard Unified Modeling Language notation) and programming (using C++ and Java), and real-time computer systems. A challenging final-year design project lets you apply your knowledge.

Your future

Prepared to design, implement and maintain complex software systems, you will be in demand

from public and private sectors in the areas of health care, aerospace, manufacturing, multimedia, information technology and telecommunication. You will be able to manage the development and deployment of software products such as embedded real-time systems in aircraft or medical devices, computer graphics and animation, online banking or e-commerce applications, multimedia and mobile computing systems, telephone switches and networks, routers, and database systems.



The course progression of the software engineering program reflects a focus on software development and supports the co-op option. Every student completes the engineering project course to gain practical engineering design experience.



Carleton's Urbandale Centre for Home Energy Research, designed as a two-storey single-family home, enables ongoing research in energy efficiency enhancement through solar power and zero-carbon technologies. The 1,600-square-foot facility acts as a test bed for innovative concepts that challenge the traditional way houses are designed and built, focusing largely on seasonal thermal storage.

Sustainable and Renewable Energy Engineering

Our planet is in need of clean and renewable sources of energy such as wind, solar, geothermal, tidal and biomass—and we need to generate, distribute and use non-renewable energy resources more effectively, by minimizing environmental impact and ensuring they make a positive contribution to sustainable development.

As a field of study, sustainable and renewable energy engineering examines the challenges confronting modern society as it attempts to meet energy needs in an economically efficient, socially responsible and environmentally friendly manner.

carleton.ca/mae
doe.carleton.ca

Your opportunities

- Access state-of-the-art laboratories for combustion and air emissions, fuel cell development, thermodynamics/energy conversion, power electronics and smart grids; a micro-fabrication facility for photovoltaics and power harvesting; a

large-scale atmospheric boundary-layer wind tunnel for wind-farm performance studies; and a water channel for the study of hydropower technology.

- Gain real experience through a final-year team design project, optional co-op work terms, and a program that emphasizes



Sustainable and Renewable Energy Engineering graduate and current Mechanical Engineering master's student, Melina Jefferson, analyzes flare generated pollutant emissions as part of the Natural Sciences and Engineering Research Council of Canada (NSERC) FlareNet Strategic Network, led by Carleton professor Matthew Johnson.

problem-solving skills, a professional focus, and hands-on laboratory work.

- Develop contacts for future employment through Carleton's close association with Hydro Ottawa, Natural Resources Canada, Siemens, and housing developers.
- For a focus on electrical engineering aspects of the field, specialize in smart technologies for power generation and distribution (Stream A). If your interest lies more with mechanical engineering aspects, you can choose efficient energy generation and conversion (Stream B).

Both streams of study—**smart technologies for power generation and distribution**, and **efficient energy generation and conversion**—provide a solid core of courses and laboratory work that prepare you for a successful professional career in industry and the public sector, or for further studies at advanced levels. Courses in basic and applied science, in combination with stream-specific topics such as electronics, smart-grid systems, heat transfer and thermodynamics, technology for generating and converting energy, and environmental issues will give you the technical and professional

tools to deal with the challenges of the energy field.

Your future

You will be well prepared for challenging positions in energy-intensive industries and related government agencies, including power utilities, generation facilities, distribution networks, smart grids and the construction industry. You will be in demand by manufacturers of materials and equipment for renewable energy projects, the hybrid vehicle design industry and emerging service industries specializing in energy efficiency, to name a few.



You might also be interested in mechanical, computer systems, electrical, or environmental engineering.

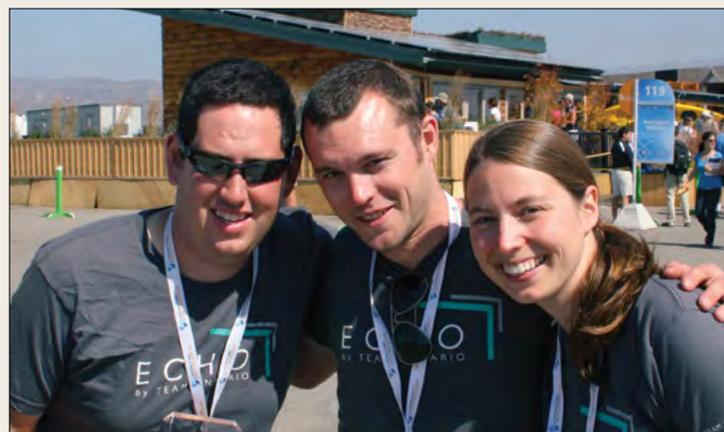
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Sustainable Design

Professor Cynthia Cruickshank (right) supervised and led Carleton's team, including students Michael Brown (middle) and Christopher Baldwin (left), in preparation for the 2013 Solar Decathlon - an international competition held in Irvine, California.

As part of Team Ontario (joining Queen's University and Algonquin College), Carleton students and faculty worked together to design and build an energy efficient house. During the competition, Team Ontario scored first place in engineering, second place in affordability, and tied for the first place in hot water draws and energy balance. The team scored sixth place overall.





Architectural Studies

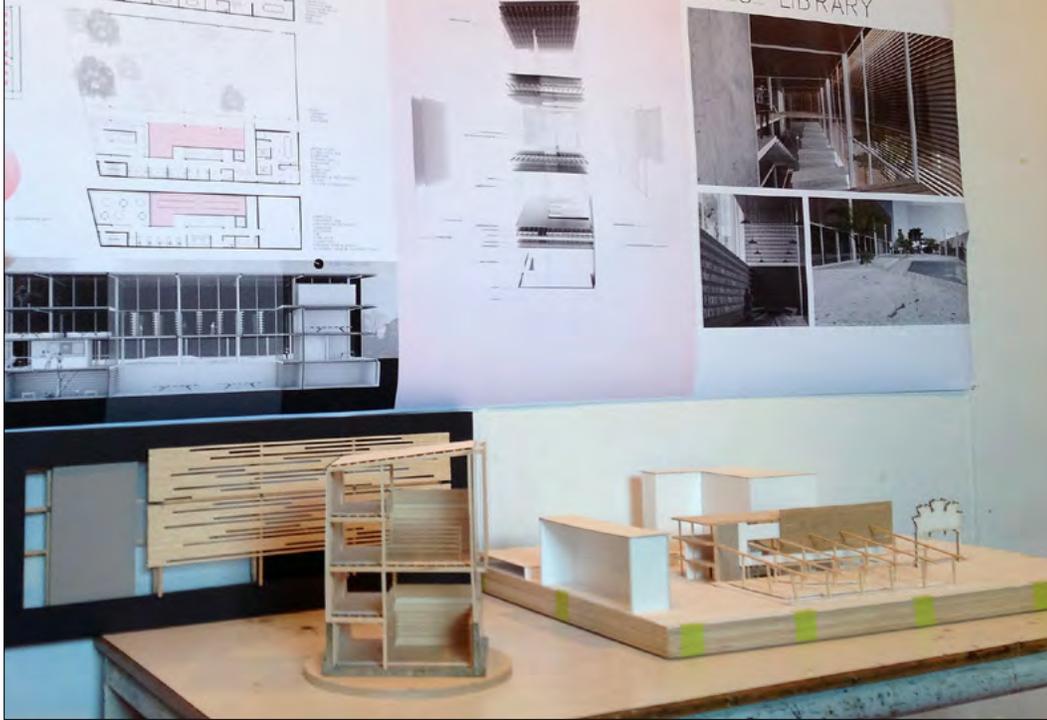
Architecture is society's most public, visible art. It reflects culture and participates in shaping it. Architects have deep concern for society, culture and the urban environment, a passion for turning ideas into reality, the ability to think critically, and an appreciation for art and technology.

The study of architecture involves an exploration of many disciplines. Whether you choose Design, Urbanism, or Conservation and Sustainability, you will learn to balance the demands of function, aesthetics, technology and economics. Developing skills in drawing, model-making, photography, video, digital media, writing and oral presentation will be central to your education experience.

Your opportunities

- Access state-of-the-art facilities including: design studios with personal work space; wood, sheet metal and welding workshops; laser cutting, 3D printing and CNC routing fabrication facilities; and a large assembly room.
- Benefit from extensive computer facilities and academic resources such

as a technical library and reading room, a new gallery in the Architecture Building (as of fall 2016), the Carleton University Immersive Media Studio (a research centre for modeling and visualization using immersive, digital and hybrid media), and the Carleton Solids and Light Tectonics Laboratory for the study of materiality in architecture.



Second-year students learn to formulate creative answers to architectural problems through drawings and models.

- Learn from the world's great architecture and architects through Directed Studies Abroad (two to four week excursions), visiting critics' studios and lectures, and the Forum Lecture Series held at the National Gallery of Canada, featuring distinguished architects from around the world.
- Explore areas such as furniture design, stage design, and advanced painting and drawing through workshop courses.

Your program

In your first year of the Bachelor of Architectural Studies program, key courses including Architecture, Drawing, Design Studio, Multimedia Applications, and Art History will lay the foundation for subsequent years.

In years 2-4, students work towards their majors in one of the following areas of study:

- **Design:** for a professional career in architecture with an emphasis on building design.
- **Urbanism:** to explore design at the scale of the block, neighbourhood and city, and promote stewardship of the built environment.

- **Conservation and Sustainability:** for the adaptive re-use of the existing building stock, the conservation of historic buildings, and the principles of sustainable design.

Each of these majors includes courses in a variety of topics including architectural history and theory, urbanism, technology, and sustainability — complemented by electives from other disciplines offered at Carleton.

Your future

Graduates of the Azrieli School of Architecture and Urbanism are at work around the world in fields as varied as building design, urban design, fashion design, filmmaking, computer animation, environmental/sustainable building consultation, project management and historical architectural preservation.

The BAS degree prepares you for graduate studies required to practice architecture in North America, or for a career in education, history, conservation, community advocacy, public policy, or a range of design fields.



You might also be interested in the engineering program in architectural conservation and sustainability.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

- Progressive co-op education option
- Scholarships for high-standing students
- Educational requirements that qualify you for professional studies at the master's level



Fourth-year students prepare an end of year showcase of their work.



Industrial Design student Kristine Vodon displays her Biobuilding project, which is a 3D-printed modular building kit that allows users to make custom home decor products.

Industrial Design

The form and function of almost all of the objects that surround us are the result of an elaborate process of design.

To meet the demands of mass manufacturing, industrial designers determine every aspect of a product. Working in teams, they examine the demand for particular products, the available materials, production methods, environmental impact, costs and whether the final product will meet the needs of prospective customers.

Your opportunities

- Access excellent facilities including design studios, digital laboratories, modeling and testing laboratories, wireless computing, and a mass-production/mould simulation laboratory and rapid prototyping equipment.

- Benefit from access to local medical and scientific research facilities, as well as popular museums.
- Develop contacts for future employment by working on projects with private- and public-sector partners. Past collaborators include Herman Miller, Black and Decker, Nureva, CNIB, the Canadian Paralympic Foundation, and the National Capital Commission.
- Gain industry experience through the internship program or co-operative option. Students work for a wide variety of companies including: IBM, Teknion, Lee Valley Tools, Mountain Equipment Co-Op, Starfish Medical and product design consulting firms.

Your program

This unique and hands-on program blends design studio with applied and social sciences. Industrial designers are visual thinkers: you will learn how to use your drawing and modeling abilities to communicate product concepts. Through progressive stages of design development, you will learn how these concepts evolve in relation to materials, technologies and manufacturing processes, ecological issues, and the users' abilities and perceptions.

The program begins with an introduction to the theory and practice of design, and courses in mathematics, physics, psychology and

Great Grad - Chad Harber, Lead Industrial Designer, Fitbit



After graduating from Carleton's Industrial Design program, Chad Harber (BID/07) headed to San Francisco on the advice of Carleton professor Bjarki Hallgrimsson. After working with NewDealDesign and progressing to the role of design manager, Harber joined start-up company Aether Things, where he would design an intelligent learning speaker. Now, as Lead Industrial Designer at Fitbit, Harber problem solves from a design point of view and visualizes new ideas for the wearable fitness technology leader by collaborating with principle designers, engineers, marketers and consumers.

You might also be interested in the Interactive Multimedia & Design Program.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

- Progressive co-op education option
- Scholarships for high-standing students

economics. In second year, topics such as mass-production technology, ergonomics, perception and computer applications are presented, along with electives from architecture, business, computer science or engineering.

In third and fourth year, you will focus on design projects, making drawings, models and full-scale prototypes and testing their viability. Projects can include almost any imaginable commodity, from medical equipment and transportation devices to building components, tools and furniture.

A highlight of the year is the school's annual graduation exhibition in April. Open to the public, the exhibition showcases the projects of senior Industrial Design students, and illustrates their incredible range of design diversity and skill. The exhibition attracts potential employers from different facets of industry.

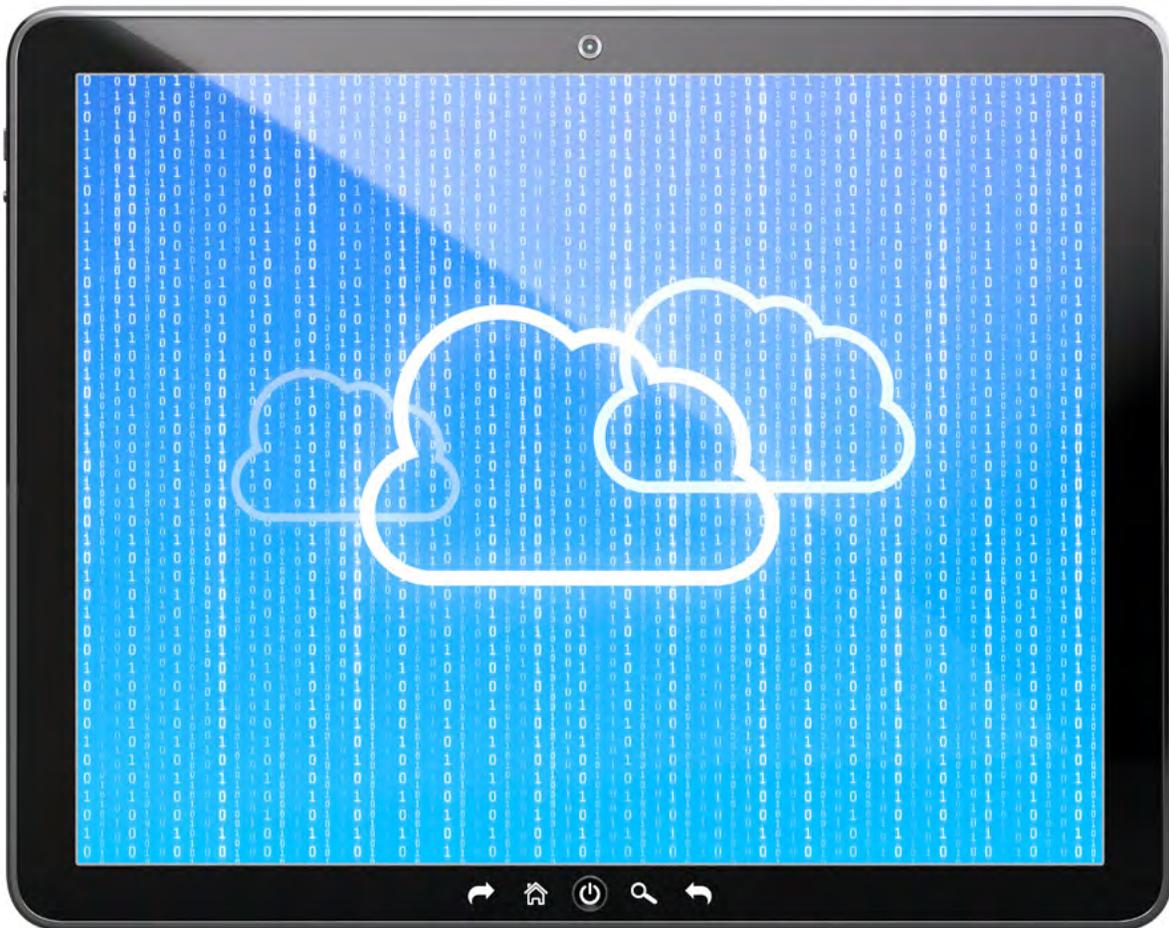
Your future

You can pursue an exciting career in industrial design, graphic design, exhibit design, packaging design or manufacturing. You could work as a design consultant or become part of an emerging

class of design entrepreneurs. Carleton grads have worked with clients all over the world, including Power Athletics, Teknion, Lee Valley Tools, Umbra, Prada, Armani and Sony—to name just a few.



Industrial Design student Micah Rakoff Bellman's design "Lift", a flexible kitchen work space, strives to provide seniors and people with disabilities with more freedom in the kitchen. His design received first prize at the 2016 Innovative Designs for Accessibility (IDeA) competition.



Information Resource Management

Organizations have evolved to generate and use an unprecedented amount of digital data, which has fundamentally changed the ways in which we work, communicate and provide services. Advances in information technology have created a pressing need to organize and manage digital information and services. Carleton's Information Resource Management (IRM) program provides the ideal opportunity to learn about information systems both in the classroom and real world.

Your Opportunities

- IRM is a unique 4-year program which enables students to graduate with both a Bachelor of Information Technology degree and a Library and Information Technician diploma.
- Blended university and college program combines a strong theoretical education with practical experience.
- Students registered in the program are enrolled at both Carleton University and Algonquin College and will benefit from facilities, teaching staff, resources and expertise at both institutions.
- Up-to-date computer labs specifically maintained for the program provide access to the latest technology in the field.
- Develop a marketable skill set. Both institutions regularly consult with representatives from industry in order to track current, emerging and future trends in information technology. Regular consultation keeps the IRM program in sync with the skills and competencies desired by employers.



You might also be interested in the Interactive Multimedia & Design Program.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

Your Program

This multidisciplinary program includes courses in information management, metadata, web interface development, programming, business, database theory and development, legal issues in information technology, communication skills, library software, marketing, special collections and network technology. The flexible structure of the program also enables students to incorporate a minor of their choice to develop a subject area specialty.

Benefit from opportunities for practicum and experiential learning including completion of projects at Carleton's MacOdrum Library. IRM also includes a flexible co-op option which enables students to gain up to 5 terms of work placement related to the field of information technology.

A bridge program has been designed for students who already have an LIT diploma to reduce the time to obtain the BIT degree.

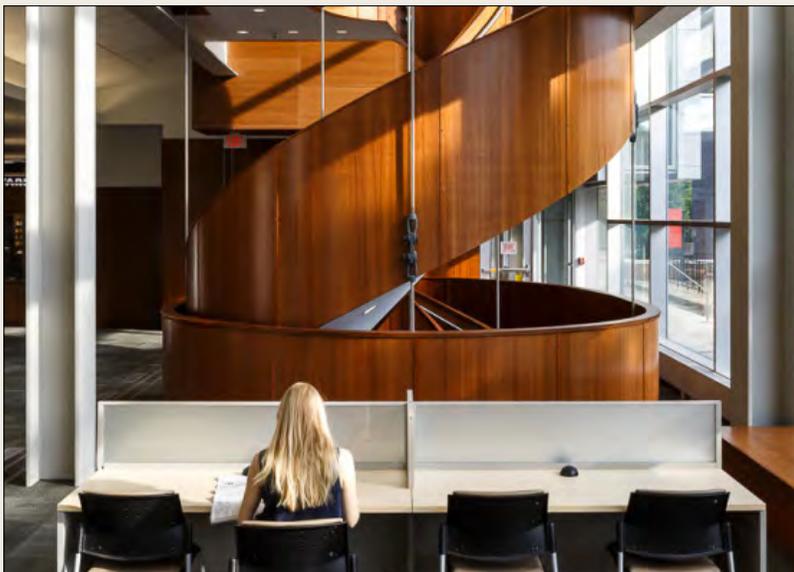
Your future

Graduates of the IRM program earn both a degree and a diploma, opening the door to a broad range of career opportunities to manage digital resources and services including:

- Information management
- Research data management
- Research institutes
- Libraries – public libraries, academic libraries, special libraries and school libraries
- Web design
- User interface design and construction
- E-commerce

- Progressive co-op education option
- Scholarships for high-standing students

Real-World Experience



Students in the IRM program will benefit from opportunities for practicum and experiential learning, including completion of projects at Carleton's newly renovated MacOdrum Library (winner of the prestigious Ontario Library Association Library Building Award 2015).

The library provides a number of state of the art facilities including the Discovery Centre for Undergraduate Research and Student Engagement which includes a gaming laboratory, 3D printing centre and multimedia laboratory. The library provides a designated space for IRM students to research, collaborate and study.



Interactive Multimedia and Design program students at work in Carleton's motion capture laboratory.

Interactive Multimedia and Design

From video games and animated shorts to educational tools and interactive websites, interactive multimedia and design professionals determine the shape of digital media, design interfaces and script the way that users will interact with the products they create.

Specialist areas in the multimedia sectors are growing rapidly in North America, Asia and Europe, resulting in an increased demand for people with

the expertise and skills that combine creativity, imagination and technology to create the next generation of multimedia-rich applications and products.

Your opportunities

- Blend college and university styled approaches in this joint program between Carleton University and Algonquin College. You will

Big Screen Success



Interactive Multimedia and Design student Taryn Laurendeau experienced first-hand what it's like to be involved in the magic of feature film production, having completed a grand total of 16 months at the Moving Picture Company (MPC) in Montreal as part of Carleton's co-op program.

After first joining MPC as a software developer, Taryn landed the role of effects department coordinator for the 2015 film *Fantastic Four*. Her effects team was largely responsible for animations involving several of the film's central characters, including Johnny Torch and The Thing.

After wrapping up post-production on the film, Taryn spent her last five months at MPC working on Disney's *The Finest Hours* as a Show Coordinator.

You might also be interested in industrial design or architecture.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

- Progressive co-op education option
- Scholarships for high-standing students

graduate with a Bachelor of Information Technology Degree and an Advanced Diploma of Applied Arts.

- Benefit from professors and instructors that have a strong understanding of the industry, track current, emerging and future trends, and are engaged in research on the leading edge of interactive multimedia.
- Access state-of-the-art laboratories, the latest technology and industry-standard equipment at both institutions.
- Develop contacts for future employment through co-op work and industry collaboration and showcase your talent at the popular annual exhibition that attracts a wide range of visitors including industry employers.

Your program

Suitable for students who are both artistically inclined and technologically adept, the Interactive Multimedia and Design program provides multidisciplinary education in digital media covering subject areas such as web design, 2D and 3D computer

animation, game design and development, visual effects, graphic design, human-computer interaction (HCI) and project management.

Your education will focus on the entire design process: taking an idea from concept to design, prototyping, testing and delivery. As a student of today and a designer of tomorrow, you will gain

practical experience and a strong theoretical foundation. You will learn how to realize the ideas that you imagine today, and determine what products are needed, how they are built and how people will use them.

Your future

Upon graduation you will be well equipped to work in and shape the digital world

of the 21st century. With a degree-diploma combination, you have career opportunities in areas such as computer animation, video game design and development, user-interface design, digital video and audio effects, multimedia development, dynamic web application design, graphic design, and e-commerce.



A team of fourth year Interactive Multimedia and Design students present their playable demo of *Halen: Ballad of the Blade Thief*, a story-driven third person action platformer, at the Faculty of Engineering and Design's annual Innovation Expo.



Network Technology

The information technology industry is fast-paced and constantly evolving. Computer networks that share resources and information are rapidly advancing and are crucial for every type of business enterprise and our daily lives. Networking professionals develop the theoretical knowledge and practical skills needed to address the IT issues of today—as well as those of the future.

A multidisciplinary education and practical experience in mobile networking, IT security issues, cloud computing, social networking and network management, and the physics of communications prepares students to design, install, operate and manage complex information networks such as those that make up the Internet.

bitdegree.ca/NET

Your opportunities

- Blend college and university styled approaches in this joint program between Carleton University and Algonquin College. You will graduate with a Bachelor of Information Technology degree and an Advanced Diploma in Technology.
- Develop analytical problem-solving and hands-on practical skills in current IT systems and technologies in a program with a strong theoretical and industrial background.
- Benefit from professors and instructors who have a strong understanding of the industry and are engaged in research on the leading edge of networking.



You might also be interested in communications engineering.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

Students in the Network Technology program have access to cutting-edge facilities, such as the Huawei-TELUS Innovation Centre for Enterprise Cloud Services.

- Access state-of-the-art laboratories and new facilities at both institutions, featuring the best technology available—such as smart classrooms and up-to-date networking equipment from Cisco.

Your program

In this multidisciplinary program you will build a strong theoretical foundation in networking technologies and learn all aspects of modern information networks, including the theory of, and hands-on experience with, the design, analysis

and operation of various networks incorporating many transmission technologies.

You will study topics in network security, wireless mobile networks, network growth and evolution, and the role that information networks play in modern organizations. Additionally, you will take business and elective courses to round out your knowledge of the role of technology in society.

Your future

With a degree-diploma combination, you have career

opportunities in a variety of interesting work environments in government, network design and management companies, finance companies, system integrators, telecom operators, educational institutions, and business enterprises requiring network design, management and operation. You will be prepared to write the Cisco Certified Network Associate and Professional certification exams, giving you industry-recognized certification that is in high demand in the job market.

- Progressive co-op education option
- Scholarships for high-standing students
- Certification exam preparation for Cisco Certified Network Associate and Cisco Certified Network Professional

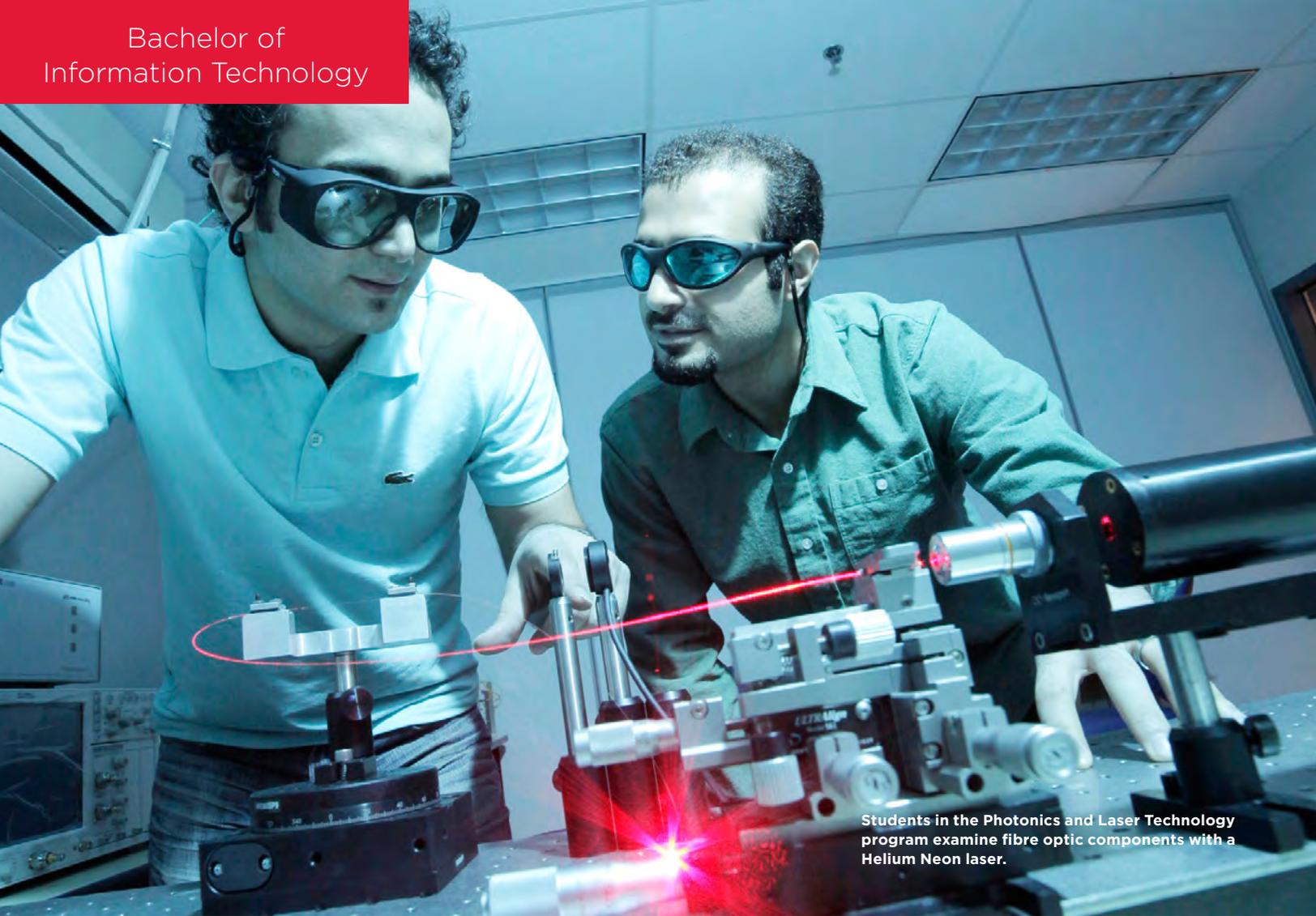
Get Noticed by Employers

Carleton provides its students with many prospects for professional networking, including the opportunity to showcase their skills in competitions involving the best students from across North America.

During his third year as a BIT - Network Technology student, Craig Labute earned second place in the 2015 Cisco Networking Academy's NetRiders competition at the CCNA level. After receiving a Cisco Certification voucher, Craig travelled to Cisco headquarters in California in January 2016 on an all-expenses paid study trip.

Upon graduating with high distinction in May 2016, Craig landed a position with Nokia, where he is currently working as a Technical Expertise Center Engineer.





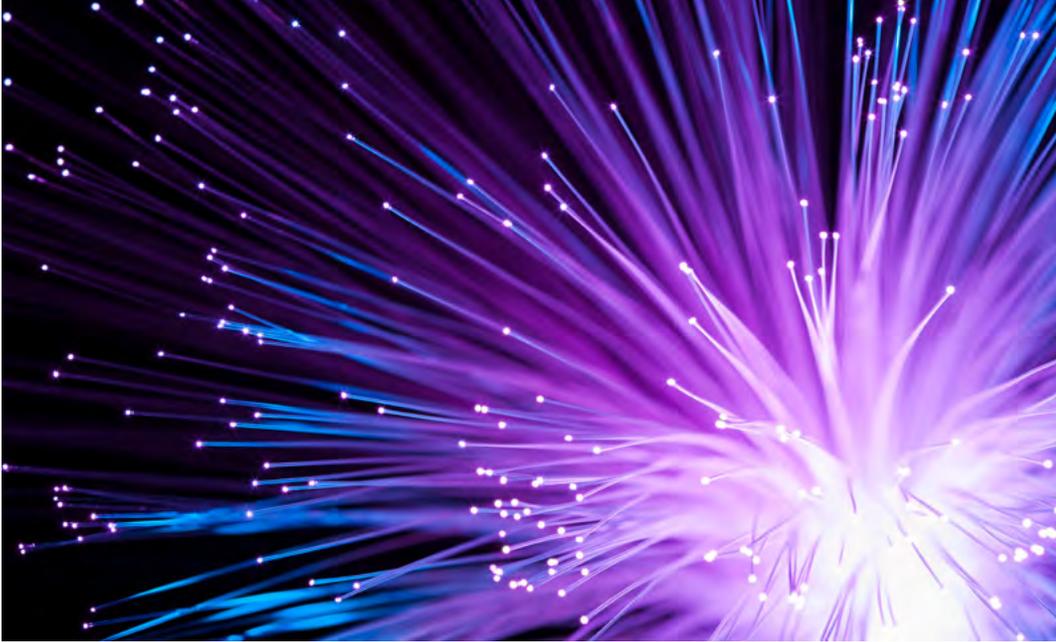
Students in the Photonics and Laser Technology program examine fibre optic components with a Helium Neon laser.

Photonics and Laser Technology

The science of generating and harnessing light has affected virtually all segments of society and industry, including the ways we communicate, harness energy from the sun, manufacture automobiles and aircraft, measure our world (including important new medical instruments and laser-based therapies) and entertain ourselves with colourful displays in all sizes and shapes. The impact of photonics in the 21st century will unquestionably surpass the effect the Electronics Age held over the last 100 years.

Your opportunities

- Blend college and university styled approaches in the Photonics and Laser Technology (PLT) program, a joint venture between Carleton and Algonquin College. You will gain knowledge that is applicable in a variety of industries and graduate with both a Bachelor of Information Technology degree and an Advanced Diploma in Technology.
- Develop analytical problem-solving and hands-on practical skills in a program with a strong theoretical and industrial background.
- Benefit from professors and instructors who have a strong understanding of the industry and are engaged in research on the leading edge of photonics.
- Access state-of-the-art laboratories and computer facilities at both institutions, including an optical and semi-conductor fabrication facility, the Centre for Nanoscale Sensor Interfaces, and Algonquin's Advanced Technology Centre.



You might also be interested in electrical engineering.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

Students in Carleton's Photonics and Laser Technology program develop the in-depth knowledge and expertise of fiber optic communications systems that is in high demand across high-tech industries.

Your program

You will begin the program by developing a strong foundation in mathematics and physics, followed by learning all aspects of photonics and lasers. Subjects covered include fundamentals of optics, theory of lasers, biophotonics, laser machining, holography, and fiber optic

communications systems. You can expect extensive hands-on experience with relevant real-world photonics and advanced laser equipment.

Your future

With a degree-diploma combination, you will have unparalleled career flexibility. Photonics technologies

permeate education, research and private industry to the degree that the possible career paths available to you would be endless. Your future could be as varied as designing displays for next generation smart phones to developing life-changing laser-based surgical equipment.

- Progressive co-op education option
- Scholarships for high-standing students

Global Opportunities

Third year Photonics and Laser Technology (PLT) student Jeff Zhao recently secured a four month international internship with Mitsubishi Electric Japan with the help of Carleton's Global Academy. Working out of Mitsubishi's Optical Communication Research and Development Center in the southern coastal city of Kamakura, Zhao is focusing on the development of cutting-edge algorithms that can optimize the structure of mesh networks and enable signals to find the most efficient path by which to travel.

"The theoretical knowledge in embedded systems and computer systems I developed through Carleton's PLT program has enabled me to be extremely versatile in my role with Mitsubishi Electric Japan," Zhao explains. "PLT also provided me with a huge boost in optical networks experience with hands-on learning opportunities in Algonquin's Optophotonics Lab."





Media Production and Design

The Bachelor of Media Production and Design will prepare you to meet the demand for innovative graduates who can operate across all facets of narratives – designing and telling non-fiction stories that engage, inform, entertain and ultimately contribute to a broader and deeper understanding of how we connect with each other in the 21st century to build stronger societies.

Your opportunities

- Carleton's all-new Media Production and Design (MPD) program is offered jointly between the Faculty of Public Affairs' School of Journalism and Communication and the Faculty of Engineering and Design's School of Information Technology, providing students with diverse skills and experience.
- Benefit from small class sections in your first year of no more than 30 students, with abundant opportunities for hands-on work and in-depth feedback.
- As you develop expertise in the program's core elements, your coursework will diversify into areas such as ethics and digital media law, emerging media industries and practical aspects such as freelancing.
- MPD students may choose to pursue a 12 month co-op option after the fall term of their third year, gaining valuable career experience with media companies, online design and production houses, government agencies, not-for profit and nongovernmental organizations, and various other corporations both within Ottawa and across the country.



You might also be interested in the *Interactive Multimedia & Design Program*.

Visit calendar.carleton.ca/undergrad for information on course and co-op education options.

Your Program

A combination of intensive hands-on workshops and lecture courses provides students with a strong foundation in data, research, writing, and narrative abilities across media formats (text, photography, audio, video, graphics). The classroom experience will build fundamental production and design skills and thinking into the development and application of narratives, with the understanding that design shapes how and what information is delivered to audiences, making “story” and “design” inseparable.

As well as acquiring editorial and technical skills, you will develop the theoretical knowledge and understanding of the power of “story” through coursework in ethics, law, civic institutions and citizen interactions via policy vehicles, data and information technology theory and the history of persuasive narration and imagery. You will learn how to combine storytelling skills traditionally taught to journalists with the design skills that come from information technology, exploring where the two intersect to engage audiences in distinctive ways.

Your future

MPD graduates will apply creative production and design thinking to information strategies and narratives that help empower citizens, strengthen communities and help organizations of all sorts tell their stories online:

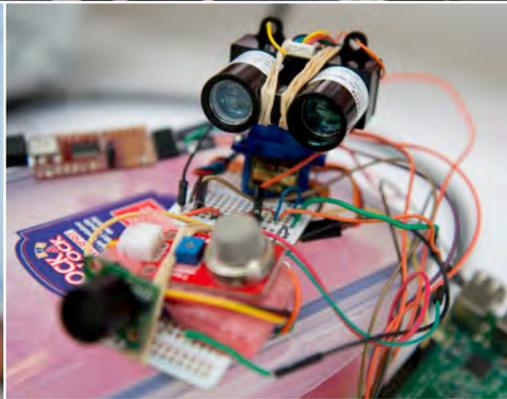
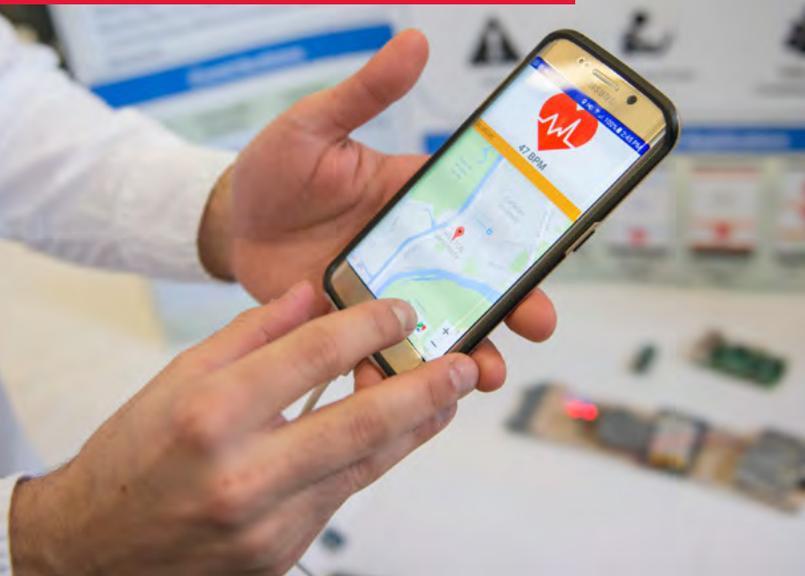
- media producers for mainstream and new digital media
- information-based producer/designers for not-for-profits, NGOs, corporation and governments

- NGOs, corporation and governments digital communications experts
- data analyst/ conceptualizers

With your Bachelor of Media Production and Design degree, you will also be able to pursue studies in Master’s programs such as Journalism or Digital Media.

- Progressive co-op education option
- Scholarships for high-standing students





Engineering Innovation

Carleton's fourth year Capstone design projects provide undergraduate engineering students with a platform to implement the theory, practice and skills they have developed over the course of their program. By culminating your education with the design of a professional-level project, you will integrate your knowledge with real-world experience in a manner that prepares you for an exciting career in engineering and design.

Capstone projects are often considered the hallmark of an undergraduate engineering degree. While engineering students at Carleton engage in hands-on design projects throughout their years of study, fourth year students are required to work in teams to produce a design innovation that incorporates everything they have learned over the course of their studies. Capstone projects

also foster an entrepreneurial spirit and passion for real-world problem solving. For students, fourth year projects are much like working on a startup, serving as an opportunity to explore new ideas which require ongoing commitment, critical thinking and improvisational skill. The defining element of Capstone projects are their real-world application, such as developing web-based

medical image processing software or utilizing uninhabited aerial vehicles (UAVs) for advanced high-resolution geomatic surveys. Many projects focus on serving the community as a whole, such as developing printable radiation detection devices or designing smart home energy systems capable of monitoring and adjusting power usage.



Graduate students operate the Full Motion CH-149 Cormorant Experimental Flight Training Device at the Carleton University Visualization and Simulation Centre.

Graduate Programs

The Faculty of Engineering and Design offers a wide array of research-intensive graduate programs for those looking to further their studies and enhance their knowledge and expertise. For more information, please visit graduate/carleton.ca.

Master of Applied Science in:

Aerospace Engineering*
 Biomedical Engineering*
 Civil Engineering*
 Electrical and Computer Engineering*
 Environmental Engineering*
 Human-Computer Interaction**
 Mechanical Engineering*
 Sustainable Energy Engineering*
 Technology Innovation Management***

Master of Architecture

2-Year Stream
 3-Year Stream (MArch1)

Master of Architectural Studies

Master of Design in:

Industrial Design

Master of Engineering in:

Aerospace Engineering*
 Biomedical Engineering*
 Civil Engineering*
 Electrical and Computer Engineering*
 Environmental Engineering*
 Infrastructure Protection and International Security**
 Mechanical Engineering*
 Sustainable Energy Engineering*
 Technology Innovation Management***

Master of Entrepreneurship in:

Technology Innovation Management***

Master of Information Technology in:

Digital Media
 Network Technology

Master of Infrastructure Protection and International Security**

Collaborative Master's in:
 Bioinformatics
 Data Science

Graduate Diploma in Architectural Conservation

Doctoral Programs:

Architecture
 Aerospace Engineering*
 Biomedical Engineering*
 Civil Engineering*
 Electrical and Computer Engineering*
 Environmental Engineering*
 Information Technology (Digital Media)
 Mechanical Engineering*

* Joint program between Carleton University and the University of Ottawa

** Joint program between the School of Information Technology, School of Computer Science (Faculty of Science) and the Department of Psychology (Faculty of Arts and Social Sciences)

*** Joint program with the Sprott School of Business

+ Joint program with the School of Public Policy and Administration (Faculty of Public Affairs)

** Joint program with the Norman Paterson School of International Affairs (Faculty of Public Affairs)



Capital Living

Ottawa is one of the world's most beautiful capital cities with its historic architecture, interconnecting waterways, park-like greenery, and extensive walking and biking trails. Elegant shops, international restaurants and a bustling market flourish in a dynamic downtown core situated in the shadow of Canada's majestic Parliament buildings. Consistently ranked as one of Canada's most livable and safe cities, Ottawa is part big city, part small town.

For students who choose to study here, Ottawa offers invaluable research facilities and work opportunities at the numerous agencies, institutions and businesses located in the city. Ottawa

also plays host to many visiting dignitaries, authors, artists, festivals and sporting events, allowing students access to events not always available elsewhere.

With all Ottawa has to offer – no matter where your tastes and interests lie, you'll find something here for you!



Campus Life

Carleton's beautiful campus is lively, diverse and caring. Students come from all over Canada and over 140 countries to study here.

Clubs and Societies

Carleton's extensive network of clubs and societies is a great way to meet new people and pursue your interests outside the classroom. With more than 200 active clubs and societies from which to choose, Carleton caters to your unique academic and social interests.

Athletic Facilities

As a Carleton student, you can take full advantage of our first-class athletic facilities, conveniently located in one area of campus. You can sign up for a fitness class, swim laps in the pool, lift weights or run on a treadmill in the brand new 11,000 sq. ft Fitness Centre, or just get together with friends to play one of your favourite sports during open recreation time. With over 140 exciting classes offered each week, as well as a variety of sport and recreational opportunities, there's something for everyone! For a complete listing of all the classes and programs offered, visit carleton.ca/athletics.

Go Ravens!

Our men's basketball team has won seven straight national titles and 13 national championships in a span of only 15 years. Are you interested in proudly donning the Raven for one of our varsity teams? Visit goravens.ca for the latest information on the Ravens, including tryout dates and coaches' contact information.

Even if you don't play on a team, the Ravens still need you! Get decked out in red and black, crank up the noise level and be part of the unbeatable atmosphere at our home games.



Making the Transition

Carleton University offers a network of support services to help you make a successful transition to university.

Our priority is to see you achieve your academic and personal goals. We can help you develop effective study skills, understand the university's academic regulations, choose or change programs and find answers to your questions. You can participate in orientation sessions, meet with academic advisors, attend workshops on study strategies, sign up for leadership development programs and access our resource material.

Asking for help and advice

Support services are in place specifically for Faculty of Engineering and Design students:

- The Undergraduate Academic Support Office provides engineering students with support and advice on schedules, registration and more. The comprehensive website carleton.ca/engineering/uas is a resource for all engineering students.
- Bachelor of Information Technology students can access bitdegree.ca

for information on their program. Academic advisors from both Algonquin College and Carleton University are available to help.

- Architecture students can find information on registration, suggested electives, announcements and events at carleton.ca/architecture. Staff are available to answer program questions and help with registration. Academic advisors are available by appointment.
- The School of Industrial Design's website id.carleton.ca is an important resource with information on registration, computer requirements, suggested electives, Orientation Week activities and more. Staff are available to assist with questions and can direct you to academic advice.

CENTRE FOR STUDENT ACADEMIC SUPPORT

Programs offered through Carleton's centralized academic advising and learning support centre (carleton.ca/csas) can help you with academic reading and note-taking, time and

stress management, and multiple-choice and general exam preparation.

STUDENT EXPERIENCE OFFICE

Helping you adjust to university life and providing support throughout your degree, the Student Experience Office (carleton.ca/seo) offers a variety of programs, such as:

- Summer, Fall and Winter Orientation to bring students to campus for tours, information gathering and to meet other students;
- Community Service Learning initiatives to help students link what they learn in class to what they experience in the community;
- Leadership Development to provide opportunities to enhance your leadership skills; and
- Parent and Family Outreach to keep families informed of news and events.

UNIVERSITY REGISTRAR'S OFFICE

The Registrar's Office manages records, transcript requests, course registration and more. carleton.ca/registrar

Supportive facilities

MACODRUM LIBRARY

The library houses more than 3.4 million books, journals, government documents, maps, newspapers, music scores, CDs, microforms, archives and rare materials. Much of the collection is available online. In the library, you can connect to the wireless network or use the Laptop Loan program. The Discovery Centre, located on the library's fourth floor, is a collaborative and creative student study space that is equipped with sofas and mobile tables and chairs to allow students to configure their study space to suit their needs. The Discovery Centre is also equipped with a Gaming Lab, Multi-media Lab and a Learning Lab. During the fall/winter term, the library hours are extended to better accommodate students' needs. library.carleton.ca

PAUL MENTON CENTRE FOR STUDENTS WITH DISABILITIES

The centre coordinates academic and support services for students with disabilities. Services include academic accommodations, attendant services, alternate formats, adaptive technology, note-taking, sign language interpretation, and learning

Great Grad - Hannah Johnston, User Experience Designer, Google



Google user experience designer and Carleton alumna Hannah Johnston recently visited Carleton to share advice and inspiration with a group of young girls taking part in Codemakers Girls Jr. Camp, hosted by Virtual Ventures, a not-for-profit technology and engineering program for youth run by Carleton's Faculty of Engineering and Design.

While studying information technology at Carleton gave Johnston the programming and technological skills she needed for a career with Google, her undergraduate studies in interactive multimedia and design prepped her with skills in computer animation and web design.

Johnston, a former director of the Virtual Ventures program, says her biggest hope is that young girls get the chance to learn how they can have fun exploring science and technology.

support and services specific to individual educational disability needs. carleton.ca/pmc

HEALTH AND COUNSELLING SERVICES

Carleton's multidisciplinary on-campus health care facility provides medical, counselling and health education services to the university's students, faculty and staff. carleton.ca/health

Future opportunities

THE WORKPLACE

A Carleton education prepares you for a career that will help to improve our society. Graduates of our well-recognized programs in engineering and design can be found living and working in Canada and around the globe.

We make sure you can graduate with work

experience and a competitive edge. All of our programs have co-op options that provide 4, 8, 12 or 16 months of work experience with more than 2,500 possible employers. In addition, our fourth-year projects provide unparalleled opportunities to explore your interests and creativity, and test your ideas and knowledge in real-world applications.

PROFESSIONAL PROGRAMS

Many programs, including law, teaching, medicine and business attract well-rounded applicants from a variety of academic backgrounds. The Faculty of Engineering and Design's programs are excellent preparation for such professional studies.

GRADUATE STUDIES

Many of our graduates continue with advanced university study at Carleton, in Canada or abroad for a master's degree or PhD. More information on Carleton's programs can be found at graduate.carleton.ca.



Ontario Admission Requirements

How to apply

All interested students must apply online through the Ontario Universities Application Centre (OUAC) website at www.ouac.on.ca. If you are presently finishing your last year of high school in Ontario, you must obtain log-in information from your school's guidance office before applying online.

For admission to undergraduate programs, Ontario students must have the Ontario Secondary School Diploma (OSSD) with six 4U/M courses. 4U English is recommended. 4U/M credits for out-of-class co-op work experience will not be considered as part of the six courses.

admissions.carleton.ca/requirements

Degree program	Areas of study	Required prerequisite courses	Notes
Bachelor of Architectural Studies	<ul style="list-style-type: none"> Conservation and Sustainability Design Urbanism 	<ul style="list-style-type: none"> English (ENG4U) Physics (SPH4U) Advanced Functions (MHF4U) (Calculus [MCV4U] recommended) 	<p>Application deadline: February 1</p> <p>Portfolio deadline: April 1</p> <p>Co-operative education available.</p>
Bachelor of Engineering	<ul style="list-style-type: none"> Aerospace Architectural Conservation and Sustainability Biomedical and Electrical Biomedical and Mechanical Civil Communications Computer Systems Electrical Engineering Physics Environmental Mechanical Software Sustainable and Renewable Energy 	<ul style="list-style-type: none"> Advanced Functions (MHF4U) Chemistry (SCH4U) Physics (SPH4U) One credit from Calculus (MCV4U), Biology (SBI4U), or Earth and Space Science (SES4U) (Calculus [MCV4U] recommended) 	<p>English or French recommended.</p> <p>Co-operative education and internships available.</p>
Bachelor of Industrial Design		<ul style="list-style-type: none"> Advanced Functions (MHF4U) Physics (SPH4U) (Calculus [MCV4U] and courses in visual arts and/or technological design are recommended) 	<p>Application deadline: March 1</p> <p>Portfolio deadline: April 1</p> <p>Information session recommended.</p> <p>Co-operative education available.</p>
Bachelor of Information Technology	<ul style="list-style-type: none"> Information Resource Management 	<ul style="list-style-type: none"> English (ENG4U) One Math credit (4U) 	Co-operative education available.
	<ul style="list-style-type: none"> Interactive Multimedia and Design 	<ul style="list-style-type: none"> Advanced Functions (MHF4U) 	<p>Application deadline: March 1</p> <p>Portfolio deadline: March 1</p> <p>The program is not designed to accommodate part-time students.</p> <p>Co-operative education available.</p>
	<ul style="list-style-type: none"> Network Technology 	<ul style="list-style-type: none"> One Math credit (4U) 	The program is not designed to accommodate part-time students. Co-operative education available.
	<ul style="list-style-type: none"> Photonics and Laser Technology 	<ul style="list-style-type: none"> Advanced Functions (MHF4U) 	The program is not designed to accommodate part-time students. Co-operative education available.
Bachelor of Media Production and Design		<ul style="list-style-type: none"> English (ENG4U) One Math credit (4U) 	<p>New program</p> <p>Co-operative education available.</p>

If you are from outside Ontario, or outside Canada, see Carleton University's website at carleton.ca/howtoapply for specific program requirements for all bachelor programs.



Connect with **Carleton**



Everything a prospective student needs to know about Carleton University can be found on our undergraduate admissions website.

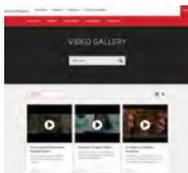
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If you have any questions or wish further information, do not hesitate to contact us. Please see the back cover for our contact information.

This document is available in a variety of accessible formats upon request. A request can be made on the Carleton University website at: carleton.ca/accessibility/request.



You have questions and we have the answers.

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TAKE A TOUR

We encourage all prospective students and their families to visit our beautiful riverside campus. Book a tour online at carleton.ca/tours, by email at tours@carleton.ca or by phone at the Undergraduate Recruitment Office number listed on the back cover.



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