University of Ottawa



Imagine the Possibilities





Faculté de génie Faculty of Engineering

Faculty of Engineering Viewbook 2012-2013

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www.engineering.uOttawa.ca



Pictures on the cover page: Kevin Bhookun



uOttawa

Faculté de génie Faculty of Engineering

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Message from the dean

Now more than ever, a university education in engineering or in computer science can open the door to a diversity of exciting and challenging professional opportunities. At the Faculty of Engineering of the University of Ottawa, you can choose among eight different programs of studies that will provide you with the required strong foundation on which to build successful and rewarding careers in the fields of engineering and of computer science. Through a number of options (e.g. engineering management and entrepreneurship, cooperative education, double degree programs), you will also have the opportunity to acquire additional skills to better prepare you for today's and tomorrow's challenges and opportunities. Furthermore, the Faculty is the only engineering school in the country offering you the opportunity to study in either English or French for all or part of your program of studies.

Home to 2,000 undergraduate and close to 800 graduate students, 200 regular faculty and staff members, and many part-time professors, the Faculty of Engineering is a major player in education and in the advancement of knowledge in engineering and in computer science in Ontario, in Canada, and beyond. In 2011, the Faculty is celebrating both its 25th anniversary as well as 65 years of continuous presence of the University of Ottawa in engineering education.

As a University of Ottawa student, you will be able to engage into many educational and extracurricular activities that no other Canadian university can offer. Each year, our engineering and computer science students distinguish themselves at various preprofessional activities and competitions in Canada and abroad. It is with great pleasure that I invite you to join our Faculty community. All of us – faculty, staff, students – are committed to your success.

Sincerely,

Clade Capi

Claude Laguë, P.Eng., ing., Ph.D. Dean

The content of this document is subject to change without notice.

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genie.engineering@uOttawa.ca

A supportive and interactive learning environment

Having problems adjusting to university life? Don't worry! The Engineering Mentorship Service is here to provide guidance and to answer your questions. Moreover, every semester the Faculty of Engineering organizes study groups for most of the first year courses so that the students in these courses have the opportunity to get together and study under the leadership of a senior student. For more information on the mentorship services and the study groups, visit www.engineering.uottawa.ca/en/undergraduate/view/mentorship_services.

The Faculty's Undergraduate Office is your one-stop shop for getting answers to questions about programs of studies, course selection or any other aspect of engineering undergraduate studies. The team at the Undergraduate Office is here to respond to your academic inquiries. You can reach the office by email at **bacinfo@engineering**. uottawa.ca, by phone at 613-562-5918 or in person at room 1020 of the SITE building.

The Faculty of Engineering: An Advantageous Choice

At the Faculty of Engineering, effort and excellence are recognized values. To encourage its students' academic success, the Faculty offers a whole range of admission scholarships.

DEAN'S MERIT SCHOLARSHIP

Number: 35

Value: Depends on admission average 95 -100% (\$5,000) 90 - 94.9% (\$4,000)

Eligibility criteria:

Be registered full time for the first time in an undergraduate program at the Faculty · Have a minimum admission average of 90% (the admission average includes the Faculty of Engineering prerequisites) This scholarship is open to all students admitted to the Faculty of Engineering (including international students) • No application is required for this scholarship; all eligible applicants will be considered.

FACULTY OF ENGINEERING MEMORIAL **SCHOLARSHIP**

Number: Seven (one scholarship for each program except computer science) Value: \$2,000

Eligibility criteria: Be a female student registered full time for the first time in an undergraduate program at the Faculty • Have a minimum scholarship average of 80% Submit a 250-word text on why you are applying for an engineering program • Submit an up-to-date resume highlighting your latest academic and extracurricular achievements · Maintain full-time registration for the fall 2012 and winter 2013 sessions

Application deadline: March 31, 2012

Application form: Online Scholarships and Bursaries (via InfoWeb)

DROSTE-KENNEDY ADMISSION SCHOLARSHIP IN CIVIL ENGINEERING

Number: Variable

Value: \$500 (minimum)

Eligibility criteria: Be registered full time in the first year of the civil engineering program (regular or co-op) • Be an Ontario resident • Have a minimum scholarship average of 80% · Demonstrate financial need **Application deadline:**

March 31, 2012

Application form: Online Scholarships and Bursaries (via InfoWeb)

NORTEL FOUNDING **SCHOLARSHIP FOR** THE SCHOOL OF EECS Number: Two

Value: \$2,500 (minimum)

Eligibility criteria: Be registered full time in first year at the School of **Electrical Engineering and** Computer Science (EECS): computer engineering, electrical engineering, software engineering or computer science • Be an Ontario resident · Have a minimum scholarship average of 80% · Be a wellrounded individual and possess computer skills Demonstrate financial need • Submit a letter from a teacher outlining your leadership, communication and computer skills • Submit a letter stating your intention to enter a co-op program at the School of EECS • Submit an official transcript including your most recent year of completed studies

Application deadline: March 31, 2012

Application form: Online Scholarships and Bursaries (via InfoWeb)

ONTARIO PROFESSIONAL ENGINEERS FOUNDATION **FOR EDUCATION SCHOLARSHIP**

Number: One for a male student and one for a female student

Value: \$1,000

Eligibility criteria: Be registered full time in the first year of an undergraduate program at the Faculty • Have a high academic standing in the final year of high school • Be a well-rounded student who exhibits leadership -Hold an Ontario Secondary School Diploma (OSSD) • Submit a resume • Submit an official transcript including your most recent year of completed studies

Application deadline: March 31, 2012

Application form: Online Scholarships and Bursaries (via InfoWeb)

Work hard, play hard

Students at the Faculty of Engineering work hard, but they also play hard! During the school year, you can join one of the engineering teams in building the best frozen fortress during the Winter Challenge snow castle competition or designing the fiercest catapult during the annual Canadian Wood Council catapult design competition. You could also participate in the Canadian National Concrete Canoe Competition or the Steel Bridge Competition. Why don't you showcase your design talents in the Canadian Society for Mechanical Engineers' student design competition? Or take on the challenge of commercializing your end-of-studies capstone design project in the annual entrepreneurship competition? Also, the Brunsfield Engineering Student Projects and Entrepreneurship Centre at the Faculty of Engineering is a dedicated facility that provides you with the space, tools and equipment to design, fabricate, and test your prototypes. The life of a student at the Faculty of Engineering is anything but dull!

Below, you will find descriptions of several of the clubs and student associations at our Faculty.

Engineers Without Borders

Put your engineering talents to good use! Engineers Without Borders works to support developing communities around the world by helping them gain access to technologies that could improve their lifestyle.

Website: www.uOttawa.ewb.ca.





Engineering Student Society (ESS) and Computer Science Student Association (CSSA)

As a Faculty student, you are served by ESS and CSSA, *your* associations. Get involved in your student community. You can get to know your colleagues better by participating in the various activities and events planned by our students. Websites: http://essaeg.ca and http://cssa.eecs.uOttawa.ca.

Advanced Robotic Innovations Society in Engineering (ARISE)

Robots are your thing? Get involved with ARISE ! This University of Ottawa student group is involved in large-scale robot design with a competitive interest in mind. Website: http://www.ariselab.ca/en

American Society of Mechanical Engineers (ASME)

Student chapter of ASME, the world's largest mechanical engineering professional organization. This organization strives to facilitate professional development through plant tours, technical seminars and networking opportunities. Website at **www.uoasme.com**.

Institute of Electrical and Electronics Engineers, Inc. (IEEE)

Technology fascinates you? The University of Ottawa student branch of IEEE brings together industry and students studying in technology-related fields while promoting a fun and stimulating university environment for students. Website: http://ewh.ieee.org/sb/ottawa/uottawa.

Canadian Society for Civil Engineering (CSCE)

The CSCE is a forum for civil engineering students to improve their professional development, exchange knowledge, gain public awareness, and network in the field of civil engineering. Website at http://by.genie.uottawa.ca/~csce/index.html.

Canadian Society for Chemical Engineering (CSChE)

The Canadian Society for Chemical Engineering is the national, not-for-profit, technical association that unites chemical engineering professionals who work in industry, academia, and government. The uOttawa chapter organizes many social and professional activities including Career Night, industrial excursions, and attendance at the national CSChE Conference.



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Dynamic and rewarding careers

Do you want a dynamic, interesting career but don't know where to begin? Do you have a passion you want to explore? Below are a few examples of engineering careers, along with a list of what to study to attain the career and lifestyle you desire.



Experience Your Future Career

Combine study and work experience! With the co-operative education (co-op) program, you have the opportunity to gain hands-on experience in your field of study while you complete your degree. For more details, visit

www.coop.uOttawa.ca.

Aerospace Engineer

- Design aerospace systems, components and vehicles.
- Design, test and conduct computer simulations of aerospace components, systems and vehicles.
- Co-ordinate testing of air and spacecraft.
- Investigate accidents, incidents and failures of aerospace vehicles, systems or components, and make recommendations to avoid reoccurrence.

Possible programs that can lead to a career in aerospace engineering: mechanical engineering, biomedical mechanical engineering, electrical engineering and software engineering.

Telecommunications Engineer

- Plan, design and co-ordinate the development, installation and operation of computer-based telecommunications systems.
- Collect and document user specifications, propose logical solutions, and develop necessary software and systems.
- Assess, troubleshoot, document, upgrade and develop maintenance procedures for operating systems, communications environments and applications software.

Possible programs that can lead to a career in telecommunications engineering: computer science, software engineering, computer engineering, electrical engineering as well as all engineering programs combined with the option in computer science.

Mobile App Developer

- Identify needs or ideas unaddressed by the software market.
- Plan, design, and implement small applications for mobile devices to address these needs.
- Evaluate and update applications based upon user feedback.

Possible programs that can lead to a career in mobile app development: computer science, software engineering, and computer engineering as well as all other engineering programs combined with the dual-degree computing technology options.

Biomedical Engineer

- Design artificial joints for use in humans.
- Research, design and produce biocompatible materials for use in medical applications.
- Plan and design innovative drug delivery systems to target diseased cells without harming the body.
- Work closely with the medical community to meet the needs of patients and improve quality of life.

Possible programs that can lead to a career in biomedical engineering: biomedical mechanical engineering, chemical engineering, computer engineering, electrical engineering, mechanical engineering and software engineering (with an option in biomedical engineering).

Environmental Engineer

- Design and implement sustainable solutions using clean technology and renewable energy to alleviate the effects of construction, pollution, and misuse of resources on our planet.
- Improve sewage, wastewater and water treatment processes to ensure that environmental and health standards are met.

Possible programs that could lead to a career in environmental engineering: both our civil engineering and chemical engineering programs offer an option in environmental engineering.

For more information about careers in engineering, please visit the Website of Career Services at www.sass.uOttawa.ca/careers/ studies.

Research at the Faculty of Engineering

The Faculty of Engineering is involved in leading-edge research and trains highly qualified personnel. We strive in all ways to promote technological progress and extend the frontiers of knowledge. Our research activities receive substantial support from various federal and provincial granting agencies as well as from University of Ottawa development funds. This has resulted in an investment of over \$65 million in research and facilities over the last five years. Through its technology and research development office, the Faculty maintains strong connections with the private sector in many programs, a relationship that ensures research relevance and benefits the local economy.



Professor Sydney Omelon Biomineralization and Bone Diseases

Dr. Sidney Omelon, a professor in the Department of Chemical and Biological Engineering, is studying the chemical mechanisms of "biomineralization" - the process by which life forms produce minerals such as calcium carbonate, calcium phosphate, or silica for use in their skeletons. By helping to understand how bones mineralize, Professor Omelon's research may contribute to new strategies for treating bone diseases such as ostoemalacia, aortic calcification leading to heart disease, and the formation of kidney stones.



Professor Fabio Variola Improving Tissue Integration

The immediate objective of Dr. Variola's research is to develop and apply surface functionalization approaches to advance current biocompatible materials by endowing them with the ability to controlling the cellular events that ultimately determine the overall biological outcome of an implanted device. In addition, Dr. Variola, a professor in the Department of Mechanical Engineering, aims at investigating the molecular and biomechanical mechanisms that guide cell response at the materialhost tissue interface.



Professor Beatriz Martín-Pérez Impact of Reinforcement Corrosion on Concrete Infrastructure

Corrosion of reinforcing steel due to the heavy use of de-icing salts in the winter is the leading cause of deterioration of highway bridges and parking garages. Dr. Beatriz Martín-Pérez, a professor in the Department of Civil Engineering, conducts experimental testing and numerical modelling of the effects of reinforcement corrosion on the performance of reinforced concrete structures. By integrating deterioration models with current methods of structural analysis, her research could lead to better assessment of the consequences of this deterioration over the life time of concrete infrastructure.



Professor Isabelle Catelas Implant Longevity Research

Dr. Isabelle Catelas established a new orthopedic bioengineering laboratory on the Health Sciences campus of the University of Ottawa and is now leading a team of researchers investigating new therapeutic engineering approaches to prolong implant longevity. To conduct this research, Dr. Catelas is taking a multi-faceted approach, bringing together ideas from a range of disciplines such as cell and molecular biology, materials science and nanotechnologies, as well as medicine. Dr. Catelas' research aims to better understand the biological mechanisms leading to implant failure, and develop innovative therapeutic approaches to control the biological response and increase implant longevity.

Visit our labs

If we piqued your curiosity about our research projects and you would like to visit our facilities and laboratories, simply contact us by email. Your parents, professors and classmates are all welcome to join you for a visit.

genie.engineering@uOttawa.ca

School of Electrical Engineering and Computer Science (EECS)



Location, location, location

The School of EECS is located in the heart of Ottawa, Canada's capital, also known as Silicon Valley North, and benefits from a well-established high-technology industry and prominent government organizations. Ottawa's innovative flair comes from its work in photonics, telecommunications and wireless, security, software, semiconductors, and a host of other areas. Ottawa has the second largest number of engineering and science related jobs in North America¹ after Silicon Valley.

OCRI

Choosing the right program for you

The School of Electrical Engineering and Computer Science (EECS) is part of the University of Ottawa's Faculty of Engineering. This interdisciplinary school combines four cutting-edge programs: computer engineering, computer science, electrical engineering and software engineering. At the School of EECS, you can study in English, in French or both — the benefits of which can help build your career.

These four programs are closely related. By bringing them together in one academic unit, students benefit from the interdisciplinary knowledge of professors who teach in one or more of the four School of EECS programs.

Market-sensitive programs

Join our quest for excellence in engineering design and innovative research. Our industry-sensitive programs offer interesting features that will help you develop enabling technologies for all aspects of human life:

- computer science: bioinformatics or management and entrepreneurship options, or build a program combining a major or minor in any science, arts or social science subject, as well as information processing;
- software engineering: biomedical option;
- electrical engineering: specializations in communications, systems engineering, electronics, microwave and photonic engineering, power and sustainable energy;
- computer, software and electrical engineering with an option in management and entrepreneurship;
- joint honours computer science and mathematics.







Learn from world-class teachers and researchers

School of EECS professors, recognized as world-class researchers and educators, have garnered many internal, national and international awards.

Our professors supervise more than 400 graduate students and lead prestigious and well-funded research projects in over 35 research groups. The SITE building is also home to advanced research laboratories in multimedia, robotics, photonics, networking, text analysis, wireless systems and software engineering. Together, these projects involve a myriad of collaborations with industry and external academic research groups. The cutting-edge research conducted at the School of EECS has helped rank the University of Ottawa among Canada's top ten universities in terms of research intensity (2008). Our innovative research has had a very positive impact on the quality and relevance of the courses taught.

Smart Car Technology Research Awarded \$8 Million

A University of Ottawa-led research network has been awarded a \$5 million grant from the Natural Sciences and Engineering Research Council of Canada (NSERC) and an additional \$3 million from industry partners towards a large-scale research program that will transform the way Canadians drive. Professor **Azzedine Boukerche** of The School of Electrical Engineering and Computer Science is the lead researcher for the Developing Next Generation Intelligent Vehicular Networks and Applications (DIVA) network, comprised of several universities, government organizations and private sector companies.

Professor Boukerche aims to design network protocols and applications for vehicular ad hoc and sensor networks (VANets) that allow high-speed communication among vehicles and ground-based infrastructure, and increase driving comfort. It represents the first NSERC Strategic Network ever hosted at the University of Ottawa.

"This welcome support demonstrates the University of Ottawa's expertise in science, technology and engineering, and highlights our role as a leader in bringing new technologies to daily practical use, for Canadians' health, security and economic progress," said Mona Nemer, vicepresident, research.

These leading-edge technologies will significantly improve efficiency, safety, productivity and general mobility on the road, while reducing threats to travel safety and security, as well as greenhouse gas emissions. Additionally, the VANets will introduce applications that will make travelling long distances more comfortable for passengers, such as location-aware services, multimedia streaming, local news, social networking, tourist information and alert messages on streets and highways.

Professor Boukerche is a full professor at the School of EECS (formerly SITE) and Canada Research Chair in Large-Scale Distributed Interactive Simulations and Mobile Computing and Networking.

The funding is part of NSERC's Strategic Network Grants (SNG) Program, which aims to increase research and training in targeted areas that could strongly enhance Canada's economy, society and/or environment within the next 10 years.

The University of Ottawa is committed to research excellence and encourages an interdisciplinary approach to knowledge creation, which attracts the best academic talent from across Canada and around the world.

For more information about the School of EECS, please visit their Website at www.eecs.uOttawa.ca.

admission

ADMISSION REQUIREMENTS

ONTARIO

General requirements: Ontario Secondary School Diploma with at least six courses at the 4U or 4M level, including prerequisites listed below. The admission average is calculated based on the six best interim or final grade 12 courses at the 4U or 4M level, including the prerequisites to the program of choice. The scholarship average is calculated based on the six best interim or final grade 12 courses at the 4U or 4M level, including the 4U or 4M level, including the prerequisites to the program of choice. The scholarship average is calculated based on the six best interim or final grade 12 courses at the 4U or 4M level, including one English 4U or *Français* 4U course.

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ENGINEERING	biotechnology (chemical eng. and biochemistry) For this program, you need to submit your application for admission to the Faculty of Science.	English or Français 4U; Advanced Functions 4U; Calculus and Vectors 4U; two of: Biology 4U, Chemistry 4U, Physics 4U, Earth and Space Science 4U A combined minimum average of 70% is required for all prerequisite courses in science and mathematics. Applicants who are missing Calculus and Vectors may take the replacement course at the university the summer before or during their first semester.
	biomedical mechanical eng. chemical eng. civil eng. computer eng. electrical eng. mechanical eng. software eng.	English or <i>Français</i> 4U; Advanced Functions 4U; Calculus and Vectors 4U; Chemistry 4U; Physics 4U A combined minimum average of 70% is required for all prerequisite courses in science and mathematics. Applicants who are missing Calculus and Vectors may take the replacement course at the university the summer before or during their first semester.
	computer science	English or Français 4U; Advanced Functions 4U; Calculus and Vectors 4U A combined minimum average of 70% is required for the prerequisite courses in mathematics. Applicants who are missing Calculus and Vectors may take the replacement course at the university the summer before or during their first semester.



ADMISSION REQUIREMENTS QUEBEC

Secondary V general requirements: Quebec Secondary School Diploma with five secondary V courses, including program-specific prerequisites. A minimum average of 84 % is required but does not guarantee admission. The admission average is calculated based on the five best sec. V courses, including the prerequisites to the program of choice. The scholarship average is based on the five best sec. V courses, including English or Français.

ENTER OUR PROGRAMS DIRECTLY

See below for details

FROM SECONDARY

Cegep general requirements: A minimum of 12 cegep courses, including program-specific prerequisites, but excluding Physical Education and make-up courses. The admission average is calculated based on completed courses, excluding Physical Education and make-up courses. We do not take the "R" rating into consideration. The scholarship average is calculated based on the six best completed courses, including one English (603) or Français (601) course, but excluding Physical Education and make-up courses. You may receive up to 15 credits of advanced standing. Credits granted depend on the courses completed, the grades achieved and the program to which you are admitted.

		SECONDARY V	CEGEP
ENGINEERING	biotechnology (chemical eng. and biochemistry) For this program, your application for admission must be submitted to the Faculty of Science	English or <i>Français</i> ; Technical and Scientific option* or Science option* (Secondary V level); Environmental and Technology or Applied Science and Technology (Secondary IV level); Chemistry 534; Physics 534) A combined minimum average of 84% is required for prerequisite courses in science and mathematics.	English (603) or <i>Français</i> (601); Mathematics (201) Calculus I; two of Biology (101) General Biology, Chemistry (202) General Chemistry or Organic Chemistry, Physics (203) Mechanics or Electricity and Magnetism, Mathematics (201) Algebra I A combined minimum average of 70% is required for prerequisite courses in science and mathematics.
	biomedical mechanical eng. chemical eng. civil eng. computer eng. electrical eng. mechanical eng. software eng.	English or <i>Français</i> ; Chemistry 534; Physics 534; Technical and Scientific option* or Science option* (Secondary IV level) A combined minimum average of 84% is required for prerequisite courses in science and mathematics.	English (603) or <i>Français</i> (601); Chemistry (202) General Chemistry or Organic Chemistry; Physics (203) Mechanics or Electricity and Magnetism; Mathematics (201) Calculus I A combined minimum average of 70% is required for all prerequisite courses in science and mathematics. Applicants who are missing one mathematics or science prerequisite may take the replacement course at the university the summer before or during their first semester.
	computer science	English or <i>Français</i> ; Technical and Scientific option* or Science option* (Secondary V level) A minimum average of 84% is required for prerequisite courses in mathematics.	English (603) or <i>Français</i> (601); Mathematics (201) Calculus I (minimum 70% required) Applicants who are missing one mathematics prerequisite may take the replacement course at the university the summer before or during their first semester.

* You will be required to do a make-up course in Functions and/or Calculus and Vector or take the challenge exam.

To acquaint yourself with the entrance requirements for a student from a province or territory other than Ontario or Quebec, please visit www.uOttawa.ca/admission.

Biomedical Mechanical Engineering

The purpose of the biomedical mechanical engineering program is to graduate engineers proficient in the areas of biomedical engineering related to mechanical engineering. These include the design of medical devices such as artificial hearts, implants, and prostheses, the development and selection of bio-compatible metallic and non-metallic materials for implants and medical equipment, robotics for medical applications, biomechanics, and rehabilitation engineering. The program structure parallels that of the regular mechanical engineering program, replacing eight courses in the regular program with biomedically-oriented courses.

It was the intention in developing this program to keep its scope broad, so that graduates may have a wide range of career choices not only in the biomedical field but also in conventional mechanical engineering. Biomedical systems are among the most complex of mechanical systems; therefore, a strong and comprehensive education in standard mechanical engineering principles is provided while emphasizing their applications in biomedical systems. The chosen name for the program and for the degree, biomedical mechanical engineering, reflects this.

Undergraduate studies (Bachelor)

BASc in Biomedical Mechanical Engineering °

BASc in Biomedical Mechanical Engineering and BSc in Computing Technology ^c (see p. 32).

c: Cooperative education is offered.

Graduate programs (Masters and PhD)

Master of Engineering (MEng) in Mechanical Engineering Master of Applied Science (MASc) in Biomedical Engineering Doctorate (PhD) in Mechanical Engineering

Graduate studies on biomedical engineering topics may also be done in the graduate programs of the Department of Mechanical Engineering, the Department of Chemical and Biological Engineering and the School of EECS, all of which offer programs leading to a Master of Engineering (MEng), Master of Applied Science (MASc) and a Doctorate (PhD).

Career opportunities

Rehabilitation engineer, biomedical engineer, mechanical engineer.

Language of instruction

All courses are offered in English. All first and second year courses, and some third year courses, are also available in French.

BASc in Biomedical Mechanical

Linginieering		132 credits	
Compulsory first year courses:			
CHM1311	Principles of Chemistry	3	
EC01192	Engineering Economics	3	
ENG1112	Technical Report Writing	3	
GNG1105	Engineering Mechanics	3	
GNG1106	Fundamentals of Engineering Computation	3	
MAT1320	Calculus I	3	
MAT1322	Calculus II	3	
MAT1341	Introduction to Linear Algebra	3	
MCG1100	Introduction to Mechanical Engineering	3	
PHY1122	Fundamentals of Physics II	3	

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What's up?

Mo Karimi and Patrick Richer, two graduate students supervised by Dr. Jodoin in the Department of Mechanical Engineering won 1st and 2nd place respectively at the student poster competition held at the 2nd Canadian Cold Spray Conference. The conference was hosted by The Industrial Materials Institute of the National Research Council (NRC-IMI) and enjoyed vast international attendance with scholars and business leaders from 11 countries worldwide presenting their latest findings and achievements. Patrick Richer's work involves the development of innovative nanocrystalline coatings for gas turbine engine protection produced using the Cold Gas Dynamic Spraying process while Mo Karimi's research involves a detailed examination of the working principles of the Shockwave Induced Spray Process (SISP) developed at the University of Ottawa Cold Spray Laboratory and commercialized by CenterLine Windsor Ltd., under the name WaveRider (TM). The technology has potential applications in a wide range of industries ranging from aerospace to medicine.

Compulsory second year courses:

MCG3110 Heat Transfer

CVG2140	Mechanics of Materials I
ELG2336	Electric Circuits and Machines for Mechanical
	Engineering
HSS2121	History of Health Care
MAT2322	Calculus III for Engineers
MAT2377	Probability and Statistics for Engineers
MAT2384	Ordinary Differential Equations and Numerical
	Methods
MCG2101	Introduction to Design
MCG2108	Mechanics II
MCG2130	Thermodynamics I
MCG2131	Thermodynamics II
MCG2141	Biological and Engineering Materials I
MCG2142	Biological and Engineering Materials II
Compulso	ry third year courses:
ELG3336	Electronics for Mechanical Engineers
GNG4170	Engineering Law
MAT3320	Mathematics for Engineers

	MCG3130	Dynamics of Machinery	3
3	MCG3131	Machine Design	3
-	MCG3141	Biomechanics	3
3	MCG3142	Biocontrol Systems	3
3	MCG3143	Bio-fluid Mechanics	3
3	MCG3306	Control Systems I	3
3	MCG3340	Fluid Mechanics I	3
3	Compulso	ry fourth year courses:	
3	HIS2129	Technology, Society and Environment since 1800	3
3	OR		
3	PHI2394	Scientific Thought and Social Values	3
3	MCG4150	Bioinstrumentation	3
3	MCG4151	Design of Artificial Joint Prostheses and Implants	3
3	MCG4152	Design of Artificial Organs	3
	MCG4308	Mechanical Vibration Analysis	3
	MCG4322	Computer-Aided Design and Manufacturing	
3		(CAD/CAM)	6
3	MCG4328	Manufacturing	3
3	MCG4340	Mechanical Engineering Laboratory	3
3	PHI2396	Bioethics	3
	Three elect	ive MCG credits at the 4000 level	3



Biotechnology

(For this program, your application for admission must be submitted to the Faculty of Science)

Learn how living organisms grow and develop and how we can use this knowledge to design manufacturing processes, chemical products or life-saving drugs. Proteins, yogurt and biodiesel are all biotechnology products. So are insulin and the chickenpox vaccine, which have saved or improved the lives of millions. The biotechnology program, which covers biology, chemistry, mathematics and other fundamental areas, allows you to complete two degrees: chemical engineering and biochemistry.

Undergraduate studies (Bachelor)

Honours BSc in Biochemistry (biotechnology) / BASc in Chemical Engineering (biotechnology) ° c: Cooperative education is offered.

Graduate programs (Masters and PhD)

Master and Doctorate in allied disciplines

Language of instruction

All courses are offered in English. French courses are available in first, second and third year.

Career opportunities

Process engineer, biomedical engineer, chemical engineer, environmental engineer, biochemist, biotechnological engineer, cell biologist, patent-law specialist

Special admission requirements

Minimum 80% average, admission not guaranteed.

Honours BSc with Specialization in Biochemistry (biotechnology) / BASc in Chemical Engineering (biotechnology) 189 credits

Compulsory first-year courses:

BI01130	Introduction to Organismal Biology	3
BI01140	Introduction to Cell Biology	3
CHG1125	Chemical Engineering Fundamentals ¹	3
CHM1311	Principles of Chemistry	3
CHM1321	Organic Chemistry I	3
MAT1320	Calculus I	3
MAT1322	Calculus II	3
MAT1341	Introduction to Linear Algebra	3
PHY1121	Fundamentals of Physics I	3
PHY1122	Fundamentals of Physics II	3
Compulso	ry second-year courses:	
BCH2333	Introduction to Biochemistry	3
BI02133	Genetics	3
CHM2120	Organic Chemistry II	3
CHM2123	Laboratory of Organic Chemistry II	3
CHM2330	Physical Chemistry: Introduction to the Molecular Properties of Matter	3
CHM2354	Analytical Chemistry	3
EC01192	Engineering Economics	3
ENG1112	Technical Report Writing	3
GNG1106	Fundamentals of Engineering Computation ²	3
MAT2377	Probability and Statistics for Engineers	3
MAT2384	Ordinary Differential Equations and	
	Numerical Methods	3
Three credi	ts of complementary studies electives ³	3
Compulso	ry third-year courses:	
BCH3120	General Intermediary Metabolism	3
BCH3125	Protein Structure and Function	3
BCH3170	Molecular Biology	3
BCH3346	Biochemistry Laboratory II	3
BCH3356	Molecular Biology Laboratory	3
BI03124	General Microbiology	3
CHG2312	Fluid Flow	3
CHG2314	Heat Transfer Operations	3
CHG2317	Introduction to Chemical Process Analysis and Design	3



Biotechnology student Kamil Mroz received a Medallion of Excellence from the Chief of the Defence Staff Genera Walter Natynczyk for outstanding community involvement. He received the award for organizing the Quo Vadis? Polish-Canadian Youth Challenge at the University of Ottawa. The conference brought together 117 students, graduates and young professionals from across the nation to celebrate Canada's multicultural heritage.

HIS2129 OR	Technology, Society and Environment since 1800	3	CHG3
PHI2394	Scientific Thought and Social Values	3	CHG4
MAT2322	Calculus III for Engineers	3	CHG4
Three cred	its of complementary studies electives ³	3	CHG4 OR
Compulso	ry fourth-year courses:		Six cr
BCH4040 BCH4172	Projet de recherche - biochimie / Honours Research - Biochemistry ^{4 & 5} Topics in Biotechnology ⁵	9 3	CHG4 CHG4 CHG4
BCH4932	Séminaire de Biochimie / Biochemistry Seminar ⁵	3	CHG4
BPS3101 OR	Genomics	3	GNG4
BCH4101	Human Genome Structure and Function	3	Three
CHG3111	Unit Operations	3	Note
CHG3112	Process Synthesis, Design and Economics	3	
CHG3122	Chemical Engineering Practice	3	¹ CH
CHG3127	Chemical Reaction Engineering	3	this
CHG3316	Transport Phenomena	3	² It is
CHG3324	Fundamentals and Applications of Chemical Engineering Thermodynamics	3	³ For Eng
CHG3326	Principles of Phase Equilibria and Chemical Reaction Equilibria	3	⁴ Du
CHG3331	Application of Mathematical Methods to Chemical Engineering	3	bio me
CHG3335	Process Control	3	The pur
Plus two c	of the following courses:		pro
BCH4122	Biomacromolecules	3	⁵ Thi
BCH4125	Cellular Regulation and Control	3	⁶ Thi
BCH4188	Nucleic Acids - Structure and Functions ⁶	3	7 000
BCH4300	Selected topics in Biochemistry ⁶	3	pro

Compulsory fifth-year courses:

CHG3337	Data Collection and Interpretation	3
CHG4116	Chemical Engineering Laboratory	3
CHG4244	Plant Design Project	6
CHG4300	Thesis and Seminar	6
OR		
Six credits of	of technical electives ⁷	6
CHG4305	Advanced Materials in Chemical Engineering	3
CHG4307	Clean Processes and Sustainable Development	3
CHG4343	Computer-Aided Design in Chemical Engineering	3
CHG4381	Introduction to Biochemical Engineering	3
GNG4170	Engineering Law	3
Three credit	ts of technical electives ⁷	3
Notes		

- ¹ CHG1125 must be taken during the first two years; it is recommended that this course be taken in first year.
- $^{\rm 2}$ $\,$ It is recommended that GNG1106 be taken in first or second year.
- ³ For a complete list of complementary studies electives, consult the Faculty of Engineering's website.
- ⁴ During the fourth year, students must either do a research project (BCH4040), or take nine additional credits among the 3000 or 4000 level courses in biochemistry, biology, biopharmaceutical sciences, cellular and molecular medecine, chemistry, pharmacology, physiology, microbiology or immunology. The research project is highly recommended for students who intend to
- pursue a career in research, but a CGPA of 7.0 is required to be eligible for the project.
- ⁵ This course runs from September to April.
- ⁶ This course may not be available every year.
- ⁷ Consult the list of technical electives in the regular Chemical Engineering program.

Course descriptions, admission requirements as well as the list of recommended courses are available on the website

www.uOttawa.ca/admission



Chemical Engineering

Chemical engineering is at the intersection of many disciplines, bridging knowledge of basic and applied sciences as well as economics and health/safety. Chemical engineering graduates enable the sustainable processing of raw natural material into finished products using a succession of operations. They are thus omnipresent in industry and during their careers will face a wide array of contemporary challenges in process optimisation and pollution control, (renewable) energy conversion, material development, and food and drug processing.

Undergraduate studies (Bachelor)

- BASc in Chemical Engineering^c
- BASc in Chemical Engineering, Biomedical Engineering Option^c
- BASc in Chemical Engineering, Engineering Management and Entrepreneurship Option ° (see p. 33)
- BASc in Chemical Engineering, Environmental Engineering Option °
- BASc in Chemical Engineering and BSc in Computing Technology^c (see p. 32)
- c: Cooperative education is offered.

Graduate programs (Masters and PhD)

Master of Engineering (MEng)

Master of Applied Science (MASc)

Doctorate (PhD)

The Department of Chemical and Biological Engineering, in collaboration with the Department of Civil Engineering, also provides a program for pursuing graduate studies in environmental engineering for MEng, MASc and PhD degrees.

Language of instruction

The first two years of the program are offered in English and French. In the third and fourth years, almost all courses are given in English only.

Career opportunities

Process engineer, petrochemical engineer, biotechnological engineer, environmental engineer, biomedical engineer.

Specific admission requirements

Please note that, although biology is not a factor in admission to the Faculty, students considering the environmental or biomedical engineering option are strongly encouraged to take it.

BASc in	Chemical Engineering 132 cm	edits
Compulso	ry first-year courses:	
CHG1125 CHM1311 CHM1321 ENG1112 GNG1105 GNG1106 MAT1320 MAT1322 MAT1341 PHY1122	Chemical Engineering Fundamentals Principles of Chemistry Organic Chemistry I Technical Report Writing Engineering Mechanics Fundamentals of Engineering Computation Calculus I Calculus II Introduction to Linear Algebra Fundamentals of Physics II	3 3 3 3 3 3 3 3 3 3 3 3 3 3
Compulso	ry second-year courses:	
CHG2312 CHG2314 CHG2317 CHM2120 CHM2330 EC01192 HIS2129	Fluid Flow Heat Transfer Operations Introduction to Chemical Process Analysis and Design Organic Chemistry II Physical Chemistry: Introduction to the Molecular Properties of Matter Engineering Economics Technology, Society and Environment since 1800	3 3 3 3 3 3 3 3 3
OR PHI2394 MAT2322 MAT2377 MAT2384	Scientific Thought and Social Values Calculus III for Engineers Probability and Statistics for Engineers Ordinary Differential Equations and Numerical Methods	333
Six credits	of complementary studies electives	6
Compulso	ry third-year courses:	
CHG3111 CHG3112 CHG3122 CHG3127 CHG3316	Unit Operations Process Synthesis, Design and Economics Chemical Engineering Practice Chemical Reaction Engineering Transport Phenomena	3 3 3 3 3
CHG3324	Fundamentals and Applications of Chemical Engineering Thermodynamics	3
CHG3331	Reaction Equilibria Application of Mathematical Methods to Chemical	3
CHG3335 CHG3337	Engineering Process Control Data Collection and Interpretation	3 3 3
Three credi	its of technical electives	3



At the PEO-Student Papers Night Competition between the Engineering faculties of Carleton University and uOttawa, the two teams from the University of Ottawa performed very well in front of a large crowd of about 110 local engineers. Because of their good performance, the University of Ottawa has won the trophy associated with this competition. In Chemical Engineering, Ms. Sheida Stephens (advisor Dr. Tezel), from CHG, whose presentation was entitled "Adsorption for Solar Heat Storage" won in the category: "Best Social and Environmental Paper".

Compulsory fourth-year courses:

CHG4116	Chemical Engineering Laboratory		
CHG4244	Plant Design Project		
CHG4900	Thesis and Seminar		
OR			
Six credits of technical electives			
CHG4305	Advanced Materials in Chemical Engineering		
CHG4307	Clean Processes and Sustainable Development		
CHG4343	Computer-Aided Design in Chemical Engineering		
CHG4381	Introduction to Biochemical Engineering		
GNG4170	Engineering Law		
Three credits of technical electives			

List of technical electives

BI02129	Ecology	3
CHG4301	Air Pollution Control Processes	3
CHG4302	Environmental Biotechnology	3
CHG4306	Microelectronics Manufacturing Processes	3
CHG4331	Introduction to Polymer Reaction Engineering	3
CHG4359	Selected Topics I	3
CHG4360	Selected Topics II	3
CHG4361	Selected Topics III	3
CHG4362	Selected Topics IV	3
CHG4364	Oil and Gas Processing	3
CHG4365	Particle Technology	3
CHG4377	Risk Assessment and Hazard Analysis	3
CHG4385	Adsorption Separations for Environmental	
	Applications	3
GNG4128	Introduction to Nuclear Engineering	3
GNG4151	Statistical Process Control	3

BASc in Chemical Engineering,Biomedical Engineering Option132 credits

To follow this option, students must complete the following courses in addition to those required for the BASc in Chemical Engineering.

ANP1105	Human Anatomy and Physiology I	3
PHI2396	Bioethics	3

Students who complete this option will be exempted from one complementary study elective and one technical elective. The remaining nine credits of technical electives must be chosen from the list of biomedical electives.

List of biomedical electives

CHG4143	Introduction to Pharmacokinetic Analysis of Drug Delive	ry
	Systems	3
CHG4160	Techniques in Biomedical Engineering	3
CHG4359	Selected Topics I ¹	3
CHG4360	Selected Topics II ¹	3
CHG4361	Selected Topics III ¹	3
CHG4362	Selected Topics IV ¹	3
MCG3143	Bio-Fluid Mechanics	3
MCG4152	Design of Artificial Organs	3

Note

3 6 6

3

¹ This course must be in the field of biomedical engineering.

BASc in Chemical Engineering, Environmental Engineering Option 132 credits

To follow this option, students must complete the following courses in addition to those required for the BASc in Chemical Engineering.

CVG2132	Fundamentals of Environmental Engineering	3
PHI2398	Environmental Ethics	3

Students who complete this option will be exempted from one complementary study elective and one technical elective. The remaining nine credits of technical electives must be chosen from the list of environmental electives.

List of environmental electives

BI02129	Ecology	3
CHG4301	Air Pollution Control Processes	3
CHG4302	Environmental Biotechnology	3
CHG4359	Selected Topics I ¹	3
CHG4360	Selected Topics I ¹	3
CHG4361	Selected Topics III ¹	3
CHG4362	Selected Topics IV ¹	3
CHG4377	Risk Assessment and Hazard Analysis	3
CHG4385	Adsorption Separations	
	for Environmental Applications	3
CVG3132	Physical / Chemical Unit Operations of Water and	
	Wastewater Treatment	3
CVG4130	Advanced Environmental Engineering	3
CVG4132	Hazardous Waste Management	3
CVG4133	Solid Waste Management	3
CVG4301	Waste Geotechnique	3

Note

¹ This course must be in the field of environmental engineering.

Civil Engineering

Civil engineers design and oversee the construction of roads, bridges, canals, and other structures. A civil engineering student at the University of Ottawa will take advantage of world class teaching laboratories, multimedia classrooms and outstanding computer facilities. With acquired expertise in computer applications, field testing and project management, the student will be well equipped to look for the best ways of using natural resources to benefit people.

Undergraduate studies (Bachelor)

BASc in Civil Engineering°

- BASc in Civil Engineering, Engineering Management and Entrepreneurship Option ° (see p. 33)
- BASc in Civil Engineering, Environmental/Water Resources Option °
- BASc in Civil Engineering, Structural/Geotechnical Option^c
- BASc in Civil Engineering and BSc in Computing Technology^c (see p. 32)
 c: Cooperative education is offered.

Graduate programs (Masters and PhD)

Master of Engineering (MEng)

Master of Applied Science (MASc)

Doctorate (PhD)

In addition, the Department of Civil Engineering, in collaboration with the Department of Chemical and Biological Engineering, also provides a program for pursuing graduate studies in environmental engineering for MEng, MASc and PhD degrees.

Language of instruction

All courses are offered in English. French courses are available in first and second year.

Career opportunities

Consulting engineer, structural or construction engineer, environmental or geotechnical engineer, water-resources engineer, municipal engineer, research engineer, contractor.

BASc in Civil Engineering	132 credits
---------------------------	-------------

Compulsory first-year courses:

CHM1311	Principles of Chemistry	3
CVG1107	Civil Engineering Graphics and Seminars	3
EC01192	Engineering Economics	3

ENG1112	Technical Report Writing	3			
GNG1105	Engineering Mechanics	3			
GNG1106	Fundamentals of Engineering Computation	3			
MAT1320	Calculus I	3			
MAT1322	Calculus II	3			
MAT1341	Introduction to Linear Algebra	3			
PHY1122	Fundamentals of Physics II	3			
Three credit	ts of science electives	3			
Compulso	ry second-year courses:				
CVG2107	Geotechnical Materials and Processes	3			
CVG2116	Introduction to Fluid Mechanics	3			
CVG2132	Fundamentals of Environmental Engineering	3			
CVG2140	Mechanics of Materials I	3			
CVG2141	Civil Engineering Materials	3			
CVG2149	Civil Engineering Mechanics	3			
CVG2171	Surveying and Measurements	3			
CVG2181	Numerical Modelling in Civil Engineering	3			
MAT2322	Calculus III for Engineers	3			
MAT2377	Probability and Statistics for Engineers	3			
MAT238/	Ordinary Differential Equations and Numerical Methods	3			
101/41/2004	ordinary Differential Equations and Numerical Methods	5			
Three credit	ts from:				
FEM2106	Women in Science and Engineering	3			
HIS2129	Technology, Society & Environment since 1800	3			
PHI2394	Scientific Thought and Social Values	3			
Compulso	ry third-vear courses:				
CVG3106	Soil Mechanics II	3			
CVG3109	Soil Mechanics I	3			
CVG3116	Hydraulics	3			
CVG3120	Hydrology	3			
CVG3132	Physical / Chemical Unit Operations of Water and	-			
	Wastewater Treatment	3			
CVG3140	Theory of Structures I	3			
CVG3141	Mechanics of Materials II	3			
CVG3147	Structural Steel Design I	3			
CVG3148	Reinforced Concrete Design I	3			
Three credit	ts of complementary studies electives	3			
Compulso	ry fourth-year courses:				
CVG4001	Introduction à la conception en génie civil / Introduction Civil Engineering Project	to 3			
CVG4108	Geotechnical Design	3			
CVG4113	Hydraulics of Water Supply and Sewer Systems	3			
CVG4130	Advanced Environmental Engineering	3			
CVG4148	Theory of Structures II	3			
CVG4150	Highway and Transportation Engineering	3			
CVG4175	Field Investigations	3			
CVG4907	Projet de conception en génie civil Civil / Engineering Design Project	3			
GNG4170	Engineering Law	3			
Three credit	ts of technical electives	2			



Dr. Dan Palermo, Assistant Professor in the Department of Civil Engineering, has been selected as the recipient of the 2011 John V. Marsh Award for Excellence in Teaching at the Faculty of Engineering. Since joining the faculty at the Faculty in 2005, Professor Palermo has proven to be an outstanding teacher while garnering praise from students and colleagues alike. Dr. Palermo is an Assistant Professor of Structural Engineering and Manager of the Structures Laboratory at the University of Ottawa.

BASc in Civil Engineering, Environmental/

List of technical electives

Geotechn	ical electives:		Water H	Resources Option	132 credits
CVG4107	Rock Mechanics	3		his option, students must complete the	
CVG4108	Geotechnical Design ¹	3	3 Io follow this option, students must complete the course		
CVG4109	Embankment Dam Engineering	3	required for the BASc in Civil Engineering with the exception of		
CVG4124	Geotechnical Design Case Histories	3	the fourth	year courses which are replaced by the	following:
CVG4184	Topics in Geotechnical Engineering I	3	CHG2317	Introduction to Chemical Process Analysis	and Design 3
CVG4185	Topics in Geotechnical Engineering II	3	CHG3316	Transport Phenomena	3
CVG4301	Waste Geotechnique	3	OR		C C
GE04301	Selected Topics in Earth Sciences	3	CVG4133	Solid Waste Management	З
MCG4102	Finite Element Analysis	3	CVG4001	Introduction à la concention en génie civil	/
Structural	electives:		0104001	Introduction to Civil Engineering Project	3
CVG4142	Structural Dynamics	3	CVG4113	Hydraulics of Water Supply and Sewer Sys	tems 3
CVG4143	Structural Steel Design II ²	3	CVG4130	Advanced Environmental Engineering	3
CVG4145	Reinforced Concrete Design II ²	3	CVG4150	Highway and Transportation Engineering	3
CVG4146	Structural Design in Timber	3	CVG4175	Field Investigations	3
CVG4148	Theory of Structures II ¹	3	CVG4907	Proiet de conception en génie civil /	
CVG4173	Construction Management ²	3		Civil Engineering Design Project	3
CVG4181	Topics in Structural Engineering I	3	GNG4170	Engineering Law	3
CVG4182	Topics in Structural Engineering II	3			
MCG4102	Finite Element Analysis	3	Three cred	its of complementary studies electives	3
Water res	ources electives:		Three cred	its of technical electives in environmental or	water
CVG4110	Hydraulics of Open Channels	3	resources e	engineering	3
CVG4111	Hydraulic Structures	3			
CVG4113	Hydraulics of Water Supply and Sewer Systems ³	3	BASc in	n Civil Engineering, Structural	V
CVG4114	Urban Water Resources	3	Genter	hnical Ontion	132 gradite
CVG4120	Design of Water Resources Systems	3	Geolee		
CVG4122	Groundwater and Seepage	3	To follow t	his option, students must complete the	course
0104186	Topics in Water Resources Engineering I	3	required f	or the BASc in Civil Engineering with the	exception of
0703242	Iopics in water Resources Engineering II	3	the fourth	year courses which are replaced by the	following:
GE03342	Introduction to Hydrogeology	3		year courses which are replaced by the	ionowing.
GE04301	Selected Topics in Earth Sciences	3	CVG4001	Introduction à la conception en génie civil	/ Introduction to
MCG4102	Finite Element Analysis	3		Civil Engineering Project	3
Environme	ental engineering electives:		CVG4108	Geotechnical Design	3
CHG4301	Air Pollution Control Processes	3	CVG4143	Structural Steel Design II	3
CHG4302	Environmental Biotechnology	3	OR		
CHG4385	Adsorption Separations for Environmental	2	CVG4173	Construction Management	3
0.10.44.00	Applications	3	CVG4145	Reinforced Concrete Design II	3
CVG4132	Hazardous waste Management	3	CVG4148	Theory of Structures II	3
0104133		3	CVG4150	Highway and Transportation Engineering	3
CVG4188	Topics in Environmental Engineering I	3	CVG4175	Field Investigations	3
CVG4189	lopics in Environmental Engineering II	3	CVG4907	Projet de conception en génie civil /	
GE04301	Selected Topics in Earth Sciences	3		Civil Engineering Design Project	3
Other elec	Ctives:	2	GNG4170	Engineering Law	3
CVG4180	Special Directed Studies	3	Three grad	its of complementary studies elective	2
0104260	Inesis	6	THEE CIEU	is or complementary studies elective	3
GNG4128	introduction to Nuclear Engineering	చ	Three cred	its of technical electives in geotechnical or s	tructural
Three credi	its of complementary studies elective	3	engineering	2 5	3

Note

¹ For regular option only.

² Except for structural and geotechnical option and except for regular option.

³ Except for environmental and water resources option and for regular option.

⁴ Except for environmental and water resources option and for regular option.

Computer Engineering

Building on a solid foundation of traditional engineering skills, this program covers many different aspects of computer software and hardware, and allows for more specialized studies in microprocessor-based systems, computer architecture, programming concepts, real-time operating systems, software engineering and robotics. This program provides multiple venues to diverse careers.

Undergraduate studies (Bachelor)

BASc in Computer Engineering^c

- BASc in Computer Engineering, Engineering Management and Entrepreneurship Option ° (see p. 33)
- c: Cooperative education is offered.

Graduate programs (Masters and PhD)

Master of Engineering (MEng) Master of Applied Science (MASc) Doctorate (PhD)

Language of instruction

All courses are offered in English and most courses are available in French.

Career opportunities

Hardware designer, computer applications engineer, embedded microsystems engineer, wireless and network systems technical manager, software developer, systems engineer.

BASc in Computer Engineering 129 credits

Compulso	ry first-year courses:	
CHM1311	Principles of Chemistry	3
GNG1105	Engineering Mechanics	3
ITI1100	Digital Systems I	3
ITI1120	Introduction to Computing I	3
1111121	Introduction to Computing II	3
MAI 1320		3
MAI 1322		3
MAI 1341	Introduction to Linear Algebra	3
MAI 1348	Discrete Mathematics for Computing	3
PHY1124	Fundamentals of Physics for Engineers	3
Compulso	ry second-year courses:	
CEG2136	Computer Architecture I	3
CSI2110	Data Structures and Algorithms	3
ELG2136	Electronics I	3
ELG2138	Circuit Theory I	3
ELG2911	Pratique professionnelle en ingénierie et technologie de l'information / Professional Practice in Information Technology and Engineering	3
ENG1112	Technical Report Writing	3
MAT2322	Calculus III for Engineers	3
MAT2377	Probability and Statistics for Engineers	3
MAT2384	Ordinary Differential Equations and Numerical Methods	3
PHY2323	Electricity and Magnetism	3
SEG2105	Introduction to Software Engineering	3
Three credi	ts of complementary studies electives	3
Compulso	ry third-year courses:	
CEG3136	Computer Architecture II	3
CEG3155	Digital Systems II	3



Interested in introducing young minds to engineering? Try Adventures in Engineering and Science (AES) Since 1991, Adventures in Engineering and Science has reached more than 200,000 through the annual, award-winning, not-for-profit, bilingual summer camps.

CEG3156 Computer Systems Design		3	List of technical electives		
CEG3185	Introduction to Computer Networks	3	CEG4112	Topics in Computer Engineering II	3
CSI3131	Operating Systems	3		Digital Control Systems	3
EC01192	Engineering Economics	3	0004140	Computer Control in Pohotico	с С
ELG3125	Signal and System Analysis	3	0504400	Computer Control in Robotics	3
ELG3155	Introduction to Control Systems	3	CEG4180		3
HIS2129	Technology, Society and Environment since 1800	3	CEG418/	Optical Networks	3
OR			CEG4188	Higher Layer Network Protocols	3
PHI2394	Scientific Thought and Social Values	3	CEG4190	Computer Network Design	3
SEG2106	Software Construction	3	CEG4198	Distributed Systems Design	3
		•	CEG4316	Digital Image Processing	3
Three credits of complementary studies electives			CEG4396	Computer Network Management	3
• •			CEG4399	Design of Secure Computer Systems	3
Compulso	ry fourth-year courses:		CSI2120	Programming Paradigms	3
CEG4136	Computer Architecture III	3	CSI2132	Databases I	3
CEG4166	Real-Time Systems Design	3	CSI2372	Advanced Programming Concepts with C++	3
CEG4912	Projet de conception en génie informatique I /		CSI3120	Programming Language Concepts	3
	Computer Engineering Design Project I	3	CSI3140	WWW Structures, Techniques and Standards	3
CEG4913	Projet de conception en génie informatique II / Compute	r	CSI4106	Introduction to Artificial Intelligence	3
	Engineering Design Project II	3	CSI4115	Introduction to Compilers	3
Three credi	its of complementary studies electives	3	ELG2137	Circuit Theory II	3
·······			ELG3136	Electronics II	3
Three credits of science studies electives			ELG4137	Principles and Applications of VLSI Design	3
12 credits of technical electives			ELG4177	Digital Signal Processing	3
				Software Design and Architecture	3
			SEG3125	Analysis and Design of User Interfaces	3

Course descriptions, admission requirements as well as the list of recommended courses are available on the website

www.uOttawa.ca/admission



Computer Science

Computer science at the School of Electrical Engineering and Computer Science (EECS) combines the fundamental study of computation and information processing, and how it applies to the world around us. Computer scientists build fast, reliable and secure software systems to organize, store and analyze information. The honours curriculum comprises advanced topics in databases, artificial intelligence, computer graphics, security, distributed computing, algorithm design, and culminates with the honours project. Our degrees are flexible and include options, minors and a major that can be used to explore the links between computer science and other fields.

Undergraduate studies (Bachelor)

Honours BSc with specialization in Computer Science°

- Honours BSc with specialization in Computer Science, Bioinformatics option $^{\circ}$
- Honours BSc with specialization in Computer Science, Management and Entrepreneurship option ° (see p.33)

Joint Honours BSc in Computer Science and Mathematics °

BSc with Major in Computer Science^c

Minor in Computer Science *

Minor in Computer Science for Scientists

- c: Cooperative education is offered as part of four-year honours bachelor's degrees.
- *: Complementary program offered only as a second discipline. Registration starts in second year.

Undergraduate degree structure

In the computer science program, students initially register for the major in computer science, which requires 60 credits, and can be accompanied by a minor or second major in another program. However, students are encouraged in first year to transfer into the honours BSc with specialization in computer science. This 120 credit program is recommended for those who want to become computing professionals or to potentially enter graduate school after graduation.

Graduate programs (Masters and PhD)

Master of Computer Science (MCS)

Master of Computer Science (MCS) degree with specialization in Bioinformatics

Master of Computer Science (MCS) degree with CO-OP option Doctorate of Philosophy in Computer Science (PhD)

Language of instruction

Compulsory courses are offered in English and French.

Career opportunities

Developer of software technologies and systems in any field, including the entertainment industry, the biotechnology industry, the government and business.

100 aredite

Honours BSc with Specialization in Computer Science

comput		120 credits
ENG1112	Technical Report Writing	3
ITI1100	Digital Systems I	3
ITI1120	Introduction to Computing I	3
ITI1121	Introduction to Computing II	3
MAT1320	Calculus I	3
MAT1322	Calculus II	3
MAT1341	Introduction to Linear Algebra	3
MAT1348	Discrete Mathematics for Computing	3
CEG2136	Computer Architecture I	3
CSI2101	Discrete Structures	3
CSI2110	Data Structures and Algorithms	3
CSI2120	Programming Paradigms	3
CSI2132	Databases I	3
CSI2911	Pratique professionnelle de l'informatique / Practice in Computing	Professional 3
MAT2377	Probability and Statistics for Engineers	3
SEG2105	Introduction to Software Engineering	3
CSI3104	Introduction to Formal Languages	3
CSI3105	Design and Analysis of Algorithms I	3
CSI3120	Programming Language Concepts	3
CSI3130	Databases II	3
CSI3131	Operating Systems	3
CSI3140	WWW Structures, Techniques and Standards	3
SEG3155	Communication and Networking	3
CSI4900	Projets de recherche / Honours Project	3
Six EECS cro or from CSI	edits from CEG, ELG & SEG courses at the 300 courses at the 4000 level	0 level 6
00	Advanced Programming Concepts with C++	2
Three FFCS	credits from CEG. FLG or SEG courses at	5
the 3000 le	vel or from CSI courses at the 4000 level	3
12 CSI cred	its at the 4000 level	12
27 credits o	f non-computing, non mathematics courses ¹	27
Three credit	s of elective courses	3

Note

¹ As electives, students are encouraged to choose fifteen credits of business or science courses (other than MAT) and twelve credits of humanities or social sciences courses. Alternatively, students may take a minor in a domain in which they expect to apply computing. The minor in information management systems is specifically designed for this. See the Telfer School of Management.

Honours BSc with Specialization in Computer

Science	, Bioinformatics Option	120 credits				
ENG1112	Technical Report Writing	3				
ITI1100	Digital Systems I	3				
ITI1120	Introduction to Computing I	3				
ITI1121	Introduction to Computing II	3				
MAT1320	Calculus I	3				
MAT1322	Calculus II	3				
MAT1341	Introduction to Linear Algebra	3				
MAT1348	Discrete Mathematics for Computing	3				
Students m	ust take two technical electives during their fir	st year.				
CEG2136	Computer Architecture I	3				
CSI2101	Discrete Structures	3				
CSI2110	Data Structures and Algorithms	3				
CSI2120	Programming Paradigms	3				
CSI2132	Databases I	3				
CSI2911	Pratique professionnelle de l'informatique /	2				
MAT2377	Probability and Statistics for Engineers	3 3				
SEG2105	Introduction to Software Engineering	3				
CSI3104	Introduction to Formal Languages	3				
CSI3105	Design and Analysis of Algorithms I	3				
CSI3120	Programming Language Concepts	3				
CSI3131	Operating Systems	3				
CSI4900	Projets de recherche / Honours Project	3				
Three FFCS	credits from CEG. CSI. FLG or SEG courses					
at the 3000) level	3				
OR						
CSI2372	Advanced Programming Concepts with C++	3				
Six CSI crec	lits at the 4000 level	6				
Core cours	ses for the option:					
BI01140	Introduction to Cell Biology	3				
BI02133	Genetics	3				
BI03102	Molecular Evolution	3				
BPS3101	Genomics	3				
BPS4104	Bioinformatics Laboratory	3				
CSI4126	Algorithms in bioinformatics	3				
12 credits of	of non-computing, non mathematics courses ¹	12				
18 credits of	of free elective courses ²	18				

Notes

¹ As electives, students are encouraged to choose 12 credits of humanities or social sciences courses.

² Within these 18 elective credits, it is recommended that students take CHM1321, CHM2120 and BCH2333.

Joint Honours BSc in Computer Science and Mathematics 120 credits

ENG1112	Technical Report Writing	3
Computer	Science (51 credits)	
ITI1100	Digital Systems I	3
ITI1120	Introduction to Computing I	3
ITI1121	Introduction to Computing II	3

CEG2136	Computer Architecture I	3
CSI2101	Discrete Structures	3
CSI2110	Data Structures and Algorithms	3
CSI2120	Programming Paradigms	3
CSI2132	Databases I	3
CSI2911	Pratique professionnelle de l'informatique / Practice in Computing	Professional 3
SEG2105	Introduction to Software Engineering	3
CSI3104	Introduction to Formal Languages	3
CSI3105	Design and Analysis of Algorithms I	3
CSI3131	Operating Systems	3
Three cred	lits from:	
CSI3130	Databases II	3
CSI3140	WWW Structures, Techniques and Standards	3
SEG3155	Communication and Networking	3
Three CSI of	r SEG credits at the 3000 level or above	3
Six CSI cred	its at the 4000 level	6
Mathemat	ics (51 credits)	
MAT1320	Calculus I	3
MAT1325	Calculus II and Introduction to Analysis ²	3
MAT1341	Introduction to Linear Algebra	3
MAT1348	Discrete Mathematics for Computing	3
MAT2122	Multivariable Calculus	3
MAT2125	Analysis I	3
MAT2141	Linear Algebra I	3
MAT2143	Algebraic Structures	3
Nine credit	ts from:	
MAT2324	Ordinary Differential Equations and Laplace Transformation	3
MAT2355	Introduction to Geometry	3
MAT2362	Logic and Set Theory	3
MAT2371	Introduction to Probability ¹	3
MAT2375	Introduction to Statistics ¹	3
12 MAT cree	dits at the 3000 level or above	12
Six MAT cree	dits at the 4000 level	6
15 credits o	f free elective courses	15

Notes

¹ To be admissible to graduate studies in computer science, students must have a course covering probability and statistics: MAT2371 and MAT2375 are currently recommended. Students planning to pursue studies at the graduate level in mathematics or statistics must consult the Department of Mathematics and Statistics for their choices of elective courses.

² The course MAT 1325 can be replaced by MAT 1322 with the permission of the Department of Mathematics and Statistics.

BSc with Major in Computer Science 60 credits

Must be combined with 60 additional credits for a complete BSc degree. You may take a second major or a minor, for example:

ITI1100	Digital Systems I	3
ITI1120	Introduction to Computing I	3
ITI1121	Introduction to Computing II	3



The CAIAC Distinguished Service Award is presented to an individual to recognize his or her outstanding service to CAIAC (formerly CSCSI) and to the Canadian artificial intelligence community. Dr. Stan Matwin is among the very first recipients of this prestigious award from the Canadian Artificial Intelligence Association. Dr. Stan Matwin also received the Faculty's 2011 George S. Glinski Award for Excellence in Research.

MAT1320 <i>OR</i>	Calculus I	3
MAT1330	Calculus for the Life Sciences I	3
MAT1322 OR	Calculus II	3
MAT1332	Calculus for the Life Sciences II	3
MAT1341	Introduction to Linear Algebra	3
MAT1348	Discrete Mathematics for Computing	3
CSI2101	Discrete Structures	3
CSI2110	Data Structures and Algorithms	3
CSI2120	Programming Paradigms	3
CSI2132	Databases I	3
CSI2911	Pratique professionnelle de l'informatique / Professiona Practice in Computing	l 3
CSI3105	Design and Analysis of Algorithms I	3
MAT2377 OR	Probability and Statistics for Engineers	3
A statistics	course required in another minor or major	3
SEG2105	Introduction to Software Engineering	3
Six credits	from:1	
CSI3120	Programming Language Concepts	3
CSI3130	Databases II	3
CSI3131	Operating Systems	3
CSI3140	WWW Structures, Techniques and Standards	3
9 additional or above ²	credits in CSI, SEG and CEG at the 3000 level	9

Notes

¹ To be considered for admission to graduate studies in computer science your course selection must include: CSI3131.

² Six of these credits may alternatively be science courses other than MAT at any level; this latter option is only available to students who would otherwise not be taking any science in their degree. CEG2136 and CSI2372 will be considered as 3000 level courses for the purpose of this rule. To be considered for admission to graduate studies in computer science the choice of courses is constrained as follows: CEG2136, CSI3104 and two non-MAT science courses or two CSI fourth year courses.

Minor in Computer Science 30 credits

This program is designed to be combined with a major or honours with specialization in a discipline other than science.

CSI2110	Data Structures and Algorithms	3
CSI2120	Programming Paradigms	3
ITI1100	Digital Systems I	3
ITI1120	Introduction to Computing I	3
ITI1121	Introduction to Computing II	3
MAT1348	Discrete Mathematics for Computing	3
Six optional credits from the list		6
Six optional credits in CSI or SEG at the 3000 level ¹ from the list		6

Note

¹ Suggested sequence of optional courses per field of interest. Note that some courses require prerequisites which are not part of the specific program requirements. (Not all 4000 level courses are offered every year).

List of optional courses

Developing software for the visual arts:			
MAT1341	Introduction to Linear Algebra	3	
CSI2101	Discrete Structures	3	
CSI3105	Design and Analysis of Algorithms I	3	
CSI4130	Computer Graphics	3	
Computing	g for biology or biochemistry:		
MAT1341	Introduction to Linear Algebra	3	
CSI2101	Discrete Structures	3	
CSI3105	Design and Analysis of Algorithms I	3	
CSI4126	Algorithms in bioinformatics	3	
Analysis a	Analysis and design in information systems:		
CSI2132	Databases I	3	
CSI3130	Databases II	3	
SEG2105	Introduction to Software Engineering	3	
SEG3101	Software Requirements Analysis	3	
Web-based	d systems and web design:		
CSI2132	Databases I	3	
CSI3140	WWW Structures, Techniques and Standards	3	
SEG2105	Introduction to Software Engineering	3	
SEG3125	Analysis and Design of User Interfaces	3	

Minor in Computer Science for Scientists

30 credits

This program is designed to be combined with a major or honours with specialization in a field of science.

Compulsory courses:

CSI2101	Discrete Structures	3
CSI2110	Data Structures and Algorithms	3
CSI3105	Design and Analysis of Algorithms I	3
ITI1120	Introduction to Computing I	3
ITI1121	Introduction to Computing II	3
MAT1320	Calculus I	3
OR		
MAT1330	Calculus for the Life Sciences I	3
MAT1322	Calculus II	3
OR		
MAT1332	Calculus for the Life Sciences II	3
MAT1341	Introduction to Linear Algebra	3
MAT1348	Discrete Mathematics for Computing	3
Three CSI of	r SEG credits at the 2000 level or above	3

Electrical Engineering

Electrical engineering is at the heart of today's exciting changes in technology and integral to their every aspect including development, design, manufacture, operation and management. As an electrical engineer, you will work with other engineers or scientists on emerging technologies. The curriculum includes courses in engineering science and design, electronics, circuits and computers and offers five technical specializations: communications, systems engineering, electronics, microwave & photonic engineering and power & sustainable energy.

Undergraduate studies (Bachelor)

BASc in Electrical Engineering^c

BASc in Electrical Engineering, Engineering Management and Entrepreneurship Option^c (see p. 34)

BASc in Electrical Engineering and BSc in Computing Technology
 ° (see p. 32)
 c: Cooperative education is offered.

Graduate programs (Masters and PhD)

Master of Engineering (MEng) Master of Applied Science (MASc) Doctorate (PhD)

Language of instruction

All courses are offered in English and most courses are offered in French.

Career opportunities

Electronics and chip designer, electromagnetics engineer, communications engineer, signal-processing engineer, products engineer, avionics engineer, biomedical engineering, renewable energy engineer.

BASC in	123 credits	
Compulso	ry first-year courses:	
CHM1311	Principles of Chemistry	3

EC01192	Engineering Economics	Э
GNG1105	Engineering Mechanics	Э
GNG1106	Fundamentals of Engineering Computation	Э
ITI1100	Digital Systems I	Э
MAT1320	Calculus I	Э

MAT1322	Calculus II	3	
MAT1341	Introduction to Linear Algebra	3	
MAT1348	Discrete Mathematics for Computing	3	
PHY1124	Fundamentals of Physics for Engineers	3	
Compulso	ry second-year courses:		
CEG2136	Computer Architecture I	3	
ELG2136	Electronics I	3	
ELG2137	Circuit Theory II	3	
ELG2138	Circuit Theory I	3	
ELG2911	Pratique professionnelle en ingénierie et technologie de l'information / Professional Practice in Information Technology and Engineering	3	
ENG1112	Technical Report Writing	3	
HIS2129 OR	Technology, Society and Environment since 1800	3	
PHI2394	Scientific Thought and Social Values	3	
MAT2322	Calculus III for Engineers	3	
MAT2384	Ordinary Differential Equations and		
	Numerical Methods	3	
PHY2323	Electricity and Magnetism	3	
Three credi	ts of complementary studies electives	3	
Compulso	ry third-year courses:		
CEG3185	Introduction to Computer Networks	3	
ELG3106	Electromagnetic Engineering	3	
ELG3125	Signal and System Analysis	3	
ELG3126	Random Signals and Systems	3	
ELG3136	Electronics II	3	
ELG3155	Introduction to Control Systems	3	
ELG3175	Introduction to Communication Systems	3	
ELG3316	Electric Machines and Power Systems	3	
Six credits	of complementary studies electives	6	
Compulso	ry fourth-year courses (students must choose one	of	
the follow	the following technical specializations):		

Communications Specialization:

ELG 4118	Wave Propagation and Antennas	3
ELG4139	Electronics III	3
ELG4156	Linear Systems	3
ELG4176	Communication Systems	3
ELG4177	Digital Signal Processing	3
ELG4179	Wireless Communication Fundamentals	3
ELG4912	Projet de design en génie électrique : Partie I /	
	Electrical Engineering Design Project : Part I	3
ELG4913	Projet de design en génie électrique : Partie II /	
	Electrical Engineering Design Project : Part II	3
PHY2361	Modern Physics	3
Three credi	ts of technical electives	3



Systems Engineering Specialization:

Oyotomo E	ngineering openalization.	
CEG4158	Computer Control in Robotics	3
ELG4137	Principles and Applications of VLSI Design	3
ELG4156	Linear Systems	3
ELG4157	Modern Control Engineering	3
ELG4159	Integrated Control Systems	3
ELG4177	Digital Signal Processing	3
ELG4912	Projet de design en génie électrique : Partie I /	
	Electrical Engineering Design Project: Part I	3
ELG4913	Projet de design en génie électrique : Partie II /	
	Electrical Engineering Design Project: Part II	3
PHY2333	Mechanics	3
Three credit	s of technical electives	3
Electronics	Specialization:	
ELG4115	Microwave Circuits	3
ELG4117	Optoelectronics and Optical Components	3
ELG4137	Principles and Applications of VLSI Design	3
ELG4139	Electronics III	3
ELG4176	Communication Systems	3
ELG4177	Digital Signal Processing	3
ELG4912	Projet de design en génie électrique : Partie I /	
	Electrical Engineering Design Project: Part I	3
ELG4913	Projet de design en génie électrique : Partie II /	
	Electrical Engineering Design Project: Part II	3
PHY2361	Modern Physics	3
Three credit	s of technical electives	3
Microwave	and Photonic Engineering Specialization:	
ELG4115	Microwave Circuits	3
ELG4118	Wave Propagation and Antennas	3
ELG4117	Optoelectronics and Optical Components	3
ELG4139	Electronics III	3
ELG4178	Optical Communications and Networking	3
ELG4179	Wireless Communication Fundamentals	3
ELG4912	Projet de design en génie électrique : Partie I /	
	Electrical Engineering Design Project: Part I	3
ELG4913	Projet de design en génie électrique : Partie II /	
	Electrical Engineering Design Project: Part II	3
PHY2311	Waves and Optics	3
Three credit	s of technical electives	3

Power and	d Sustainable Energy Specialization:		
ELG4139	Electronics III	3	
ELG4157	Modern Control Engineering	3	
ELG4159	Integrated Control Systems	3	
ELG4125	Electric Power Transmission, Distribution & Utilization	3	
ELG4126	Sustainable Electrical Power Systems	3	
ELG4179	Wireless Communication Fundamentals	3	
ELG4912	Projet de design en génie électrique: Partie I /		
	Electrical Engineering Design Project: Part I	3	
ELG4913	Projet de design en génie électrique: Partie II / Electrical Engineering Design Project: Part II	3	
EVS1101	Introduction to Environmental Science	3	
Three credits of technical electives 3			
List of tee	chnical electives		
CEG4158	Computer Control in Robotics	3	
CEG4186	Wireless Networks	3	
CEG4187	Optical Networks	3	
CEG4188	Higher Layer Network Protocols	3	
CEG4190	Computer Network Design	3	
CEG4316	Digital Image Processing	3	
CEG4396	Computer Network Management	3	
ELG4115	Microwave Circuits	3	
ELG4118	Wave Propagation and Antennas	3	
ELG4117	Optoelectronics and Optical Components	3	
ELG4121	Topics in Electrical Engineering II	3	
ELG4122	Topics in Electrical Engineering I	3	
ELG 4125	Electric Power Transmission, Distribution		

and Utilization ELG4126 Sustainable Electrical Power Systems ELG4137 Principles and Applications of VLSI Design ELG4139 Electronics III ELG4156 Linear Systems ELG4157 Modern Control Engineering ELG4159 Integrated Control Systems ELG4176 **Communication Systems** ELG4177 **Digital Signal Processing** ELG4178 Optical Communications and Networking ELG4179 **Wireless Communication Fundamentals**

Course descriptions, admission requirements as well as the list of recommended courses are available on the website www.uOttawa.ca/admission



Mechanical Engineering

If it moves, a mechanical engineer designed it! Mechanical engineers are responsible for a wide range of mechanical, thermal, and biomedical systems and devices, from computer parts to power plants and from manufacturing systems to spacecraft. This is a broadly-based area of engineering, and graduates find work in almost every sector of industry, including high-tech, aerospace, manufacturing, automotive, energy, biomedical or consulting engineering.

Undergraduate studies (Bachelor)

BASc in Mechanical Engineering^c

- BASc in Mechanical Engineering, Engineering Management and Entrepreneurship Option ° (see p. 34)
- BASc in Mechanical Engineering and BSc in Computing Technology ° (see p. 32)
- c: Cooperative education is offered.

Graduate programs (Masters and PhD)

Master of Engineering (MEng) Master of Applied Science (MASc) Doctorate (PhD)

Language of instruction

All courses are offered in English. All first and second year courses, and some third year courses, are also available in French.

Career opportunities

Aeronautical/aerospace engineer, automotive engineer, manufacturing engineer, robotics/automation/controls engineer, energy systems engineer, biomedical engineer, consulting engineer, renewable energy engineer.

BASc in Mechanical Engineering 132 credits

Compulsory first-year courses:

CHM1311	Principles of Chemistry	3
EC01192	Engineering Economics	3
ENG1112	Technical Report Writing	3
GNG1105	Engineering Mechanics	3
GNG1106	Fundamentals of Engineering Computation	3
MAT1320	Calculus I	3
MAT1322	Calculus II	3
MAT1341	Introduction to Linear Algebra	3
MCG1100	Introduction to Mechanical Engineering	3
PHY1122	Fundamentals of Physics II	3
Compulso	ry second-year courses:	
ADM1100	Introduction to Business Management	3
CVG2140	Mechanics of Materials I	3
ELG2336	Electric Circuits and Machines for Mechanical	
	Engineering	3
MAT2322	Calculus III for Engineers	3
MAT2377	Probability and Statistics for Engineers	3
MAT2384	Ordinary Differential Equations and Numerical Methods	3
MCG2101	Introduction to Design	3
MCG2108	Mechanics II	3
MCG2130	Thermodynamics I	3
MCG2131	Thermodynamics II	3
MCG2360	Engineering Materials I	3
MCG2361	Engineering Materials II	3
Compulso	ry third-year courses:	
ELG3336	Electronics for Mechanical Engineers	3
GNG4170	Engineering Law	3
MAT3320	Mathematics for Engineers	3
MCG3110	Heat Transfer	3
MCG3130	Dynamics of Machinery	3
MCG3131	Machine Design	3
MCG3145	Advanced Strength of Materials	3
MCG3306	Control Systems I	3
MCG3307	Control Systems II	3
MCG3340	Fluid Mechanics I	3
MCG3341	Fluid Mechanics II	3



The uOttawa IonRide team, comprised of dedicated mechanical engineering students, won first prize in three separate categories at the 2010 ASME Student Professional Development Conference (SPDC) in Erie, Pennsylvania.

Compulsory fouth-year courses:

HIS2129	Technology, Society and Environment since 1800	3
OR		
PHI2394	Scientific Thought and Social Values	3
MCG4308	Mechanical Vibration Analysis	3
MCG4322	Computer-Aided Design and Manufacturing	
	(CAD/CAM)	6
MCG4328	Manufacturing	3
MCG4340	Mechanical Engineering Laboratory	3
12 credits of technical electives		12
Three credits of complementary studies electives		3

List of technical electives

Specialization A: Fluid Mechanics - Heat Transfer:			
MCG4104	Building Energy Systems	З	
MCG4110	Fluid Machinery	З	
MCG4111	Internal Combustion Engines	3	
MCG4126	Energy Conversion	З	
MCG4128	Basic Nuclear Engineering	3	
MCG4139	Computational Methods in Fluid Mechanics and Heat		
	Transfer	З	
MCG4325	Gas Dynamics	З	
MCG4345	Aerodynamics	3	

MCG4102	Finite Element Analysis	3
MCG4107	Dynamics II	3
MCG4109	Analysis of Engineering Problems	3
MCG4127	Applications of Computers in Mechanical Engineering	3
MCG4155	Advanced Engineering Materials	3
MCG4324	Value Engineering and Analysis	3
MCG4329	Reliability and Maintainability in Engineering Design	3
Specializa	tion C: CAD/CAM - Industrial Engineering:	
MCG4108	Industrial Control Systems	3
MCG4130	Industrial Planning	3
MCG4131	Production Engineering	3
MCG4132	Robot Mechanics	3
MCG4133	Automation Design and Control	3
MCG4134	Robot Design and Control	3
MCG4136	Mechatronics	3
MCG4175	Engineering Management and Economics	3
MCG4327	Quality Control in Equipment Design and Manufacturing	3
MCG4331	Process Planning	3
MCG4333	Instrumentation for Measurement and Control	3
Other tech	nical electives:	
MCG4100	Thesis	6
MCG4125	Biomedical Manufacturing Process	3
MCG4153	Biomedical Engineering Research Project	3
MCG4190	Selected Topics I	3
MCG4191	Selected Topics II	3
MCG4220	Thesis	6



Software Engineering

The software engineering program teaches its students to solve problems through the systematic development and evolution of large software systems within cost and time constraints. Students learn how to apply engineering principles when performing requirements analysis, measurement, modeling, design, validation, implementation, testing, documentation, and management. Software engineers are key professionals in all industries including high-tech, finance, telecommunications, government, healthcare, transportation, and entertainment.

Undergraduate studies (Bachelor)

BASc in Software Engineering^c

BASc in Software Engineering, Biomedical Option °

- BASc in Software Engineering, Engineering Management and Entrepreneurship Option ° (see p. 34)
- c: Cooperative education is offered.

Graduate programs (Masters and PhD)

Master of Engineering (MEng) Master of Applied Science (MASc) Doctorate (PhD)

Language of instruction

Software engineering courses are offered in English and French. Advanced courses are generally offered only in English.

Career opportunities

Software engineer, systems architect, computer security analyst, quality assurance engineer, video game designer, systems analyst, user interface designer, telecommunications engineer.

BASc in Software Engineering 132 credits

Compulsory first-year courses:

CHM1311	Principles of Chemistry	3
GNG1105	Engineering Mechanics	3
ITI1100	Digital Systems I	3
ITI1120	Introduction to Computing I	3
ITI1121	Introduction to Computing II	3
MAT1320	Calculus I	3
MAT1322	Calculus II	3
MAT1341	Introduction to Linear Algebra	3
MAT1348	Discrete Mathematics for Computing	3
PHY1124	Fundamentals of Physics for Engineers	3

Compulso	ry second-year courses:		
ADM1100	Introduction to Business Management	3	
CEG2136	Computer Architecture I	3	
CSI2101	Discrete Structures	3	
CSI2110	Data Structures and Algorithms	3	
CSI2132	Databases I	3	
EC01192	Engineering Economics	3	
ENG1112	Technical Report Writing	3	
MAT2377	Probability and Statistics for Engineers	3	
SEG2105	Introduction to Software Engineering	3	
SEG2106	Software Construction	3	
SEG2911	Pratique de la profession d'ingénieur logiciel / Professional Software Engineering Practice	3	
Three credi	ts of science electives	3	
Compulso	ry third-year courses:		
CSI3105	Design and Analysis of Algorithms I	3	
CSI3131	Operating Systems	3	
SEG3101	Software Requirements Analysis	3	
SEG3102	Software Design and Architecture	3	
SEG3103	Software Quality Assurance	3	
SEG3125	Analysis and Design of User Interfaces	3	
SEG3155	Communication and Networking	3	
HIS2129 OR	Technology, Society and Environment since 1800	3	
PHI2394	Scientific Thought and Social Values	3	
Three credits of complementary studies electives			
Three credi	ts of computing electives	3	
Three credits of engineering electives			
Compulso	ry fourth-year courses:		
SEG4105	Software Project Management	3	
SEG4145	Real Time and Embedded Software Design	3	
SEG4910	Projet génie logiciel de fin d'études 1 ^{re} partie/ Software Engineering Capstone Project - Part 1	3	
SEG4911	Projet génie logiciel de fin d'études 2° partie/ Software Engineering Capstone Project - Part 2	3	
Three credi	ts of science electives	3	
Three credits of computing electives			
15 credits of	of technical electives	15	
List of co	mputing electives		
CEG3136	Computer Architecture II	3	

CEG3136	Computer Architecture II	3
CEG3155	Digital Systems II	3
CSI2120	Programming Paradigms	3
CSI2372	Advanced Programming Concepts with C++1	3
CSI3130	Databases II	3

CSI3140	WWW Structures, Techniques and Standards	3
CSI4139	Design of Secure Computer Systems	3
SEG4110	Advanced Software Design and Reengineering	3
SEG4156	Telecommunications Software Design and Analysis	3
SEG4189	Introduction to Electronic Commerce	3

List of engineering electives

CHG2317	Introduction to Chemical Process Analysis and Design	3
CVG2141	Civil Engineering Materials	3
CVG2149	Civil Engineering Mechanics	3
ELG2138	Circuit Theory I	3
MCG2108	Mechanics II	3
MCG2130	Thermodynamics I	3
MCG2360	Engineering Materials I	3

List of technical electives

Choose a) three technical courses from the suggested areas of specialization (you can chose from more than one area), and b) two courses from the SEG, CSI, CEG, ELG course list at or above the 3000 level and/or from the list of additional technical electives.

Telecommunications Specialization

SEG4156	Telecommunications Software Design and Analysis	3		
And two courses from:				
CEG4188	Higher Layer Network Protocols	3		
CEG4190	Computer Network Design	3		
CEG4396	Computer Network Management	3		
CSI4118	Computer Networks and Protocols	3		
Electronic	Commerce Specialization			
ADM1340	Financial Accounting	3		
CSI3140	WWW Structures, Techniques and Standards	3		
SEG4189	Introduction to Electronic Commerce	3		
Security S	pecialization			
CSI4108	Cryptography	3		
CSI4128	Introduction to Distributed Systems	3		
CEG4399	Design of Secure Computer Systems	3		
Additional	technical electives ² :			
ADM3378	Electronic Business	3		
GEG2320	Introduction to Geomatics	3		

Notes

¹ CSI2372 is recommended for CO-OP students.

² At most, one course outside of the Faculty of Engineering, is allowed as a technical elective. Faculty approval required.

BASc in Software Engineering, **Biomedical Option**

This option is available as of the second year.

132 credits

Compulsory second-year courses.

Compuisor	y second-year courses.		
BI01130	Introduction to Organismal Biology		3
CEG2136	Computer Architecture I		3
CHM1321	Organic Chemistry I		3
CSI2101	Discrete Structures		3
CSI2110	Data Structures and Algorithms		3
CSI2132	Databases I		3
ELG2138	Circuit Theory I		3
ENG1112	Technical Report Writing		3
MAT2377	Probability and Statistics for Engineers		3
MCG2141	Biological and Engineering Materials I		3
SEG2105	Introduction to Software Engineering		3
SEG2106	Software Construction		3
Compulsor	ry third-year courses:		
CHM2120	Organic Chemistry II	:	3
CSI3105	Design and Analysis of Algorithms I		3
CSI3131	Operating Systems		3
EC01192	Engineering Economics		3
SEG3101	Software Requirements Analysis		3
SEG3102	Software Design and Architecture		3
SEG3103	Software Quality Assurance		3
SEG3125	Analysis and Design of User Interfaces	:	3
SEG3155	Communication and Networking		3
Three credit	s of biomedical electives	:	3
Three credit	ts of technology in society electives	:	3
Compulsor	ry fourth-year courses:		
BCH2333	Introduction to Biochemistry	:	3
BI01140	Introduction to Cell Biology		3
SEG2911	Pratique de la profession d'ingénieur logiciel / Professional Software Engineering Practice		3
SEG4105	Software Project Management		3
SEG4145	Real Time and Embedded Software Design		3
SEG4910	Projet génie logiciel de fin d'études 1 ^{re} partie/ Software Engineering Capstone Project - Part 1		3
SEG4911	Projet génie logiciel de fin d'études 2° partie/		2
	Software Engineering Capstone Project - Part 2		3
Nine credits	of biomedical electives	1	9
Three credits of computing electives 3			3



Professors at the School of EECS, Liam Peyton and Daniel Amyot are working in collaboration with IBM and the Telfer School of Management. IBM has recently invested \$7.9 million into business analytics software that will help accelerate research around situational and social media analytics, healthcare operations and ecological/environmental monitoring. By working with their professors on this project, students will develop the relevant skills needed for careers in key industries such as health care, green infrastructure, clean energy and utilities, education, transportation and public service.

List of technology in society electives

List of biomedical electives		
PHI2396	Bioethics	3
PHI2394	Scientific Thought and Social Values	3
HSS2121	History of Health Care	3
HIS2129	Technology, Society and Environment since 1800	3

Choice of courses at the 3000 level and above from SEG, CSI, CEG, ELG or MCG of which at least two courses must be selected from the following:

CEG4316	Digital Image Processing	3
CSI4126	Algorithms in bioinformatics	3
ELG3125	Signal and System Analysis	3
MCG2142	Biological and Engineering Materials II	3

List of computing electives

CEG3136	Computer Architecture II	3
CEG3155	Digital Systems II	3
CSI2120	Programming Paradigms	3
CSI2372	Advanced Programming Concepts with C++1	3
CSI3130	Databases II	3
CSI3140	WWW Structures, Techniques and Standards	3
CSI4139	Design of Secure Computer Systems	3
SEG4110	Advanced Software Design and Reengineering	3
SEG4156	Telecommunications Software Design and Analysis	3
SEG4189	Introduction to Electronic Commerce	3

Note

¹ CSI2372 is recommended for CO-OP students.

Course descriptions, admission requirements as well as the list of recommended courses are available on the website

www.uOttawa.ca/admission



Computing Technology

Upon completion of a BASc in chemical, civil, electrical mechanical engineering or biomedical mechanical engineering, a student who completes the requirements specified below for 30 extra credits will be eligible for a BSc in computing technology, as a second degree. The remaining credits are from their engineering degree. Students follow the engineering degree requirements and the computing technology degree requirements in parallel. A student will not be awarded the computing technology degree without also completing the corresponding engineering degree.

The following courses are common to all programs with the BSc in computing technology.

ITI1120	Introduction to Computing I ¹	3
CSI2110	Data Structures and Algorithms	3
CSI2120	Programming Paradigms	3
ITI1121	Introduction to Computing II	3

Note

¹ This course replaces GNG1106 in the BASc in the corresponding engineering degree for the purpose of the double degree BASc in the corresponding engineering degree and BSc in computing technology.

BASc in Biomedical Mechanical Engineering and BSc in Computing Technology 162 credits

CEG2136	Computer Architecture I	3
CEG3136	Computer Architecture II	3
CSI2372	Advanced Programming Concepts with C++	3
CSI3131	Operating Systems	3
ITI1100	Digital Systems I	3
MAT1348	Discrete Mathematics for Computing	3
Three credit at the 2000	ts chosen from SEG or CEG courses) level or above	3

BASc in Chemical Engineering and BSc in Computing Technology

BSc in Computing Technology		162 credits
ADM1100	Introduction to Business Management	3
CEG2136	Computer Architecture I	3
ELG2336	Electric Circuits and Machines for Mechanical Engineering	3
ITI1100	Digital Systems I	3
MAT1348	Discrete Mathematics for Computing	3
Three credi at the 2000	ts chosen from CSI, SEG, CEG or ELG courses) level or above	3
Three credits chosen from CSI, SEG or ELG courses at the 3000 level or above		3

BASc in Civil Engineering and BSc in Computing Technology

ITI1100	Digital Systems I	3
MAT1348	Discrete Mathematics for Computing	3
SEG2105	Introduction to Software Engineering	3
12 credits Earth Scier CSI or SEG	chosen from GE04301 Selected Topics in nces (GIS for Science and Engineering), courses at the 2000 level or above	12

162 credits

153 credits

162 credits

BASc in Electrical Engineering and BSc in Computing Technology

CSI2101	Discrete Structures	3
CSI2372	Advanced Programming Concepts with C++	3
CSI3120	Programming Language Concepts	3
CSI3131	Operating Systems	3
SEG2105	Introduction to Software Engineering	3
SEG2106	Software Construction	3
Three credi	ts chosen from CSI, SEG, or CEG courses	
at the 3000	D level or above	3

BASc in Mechanical Engineering and BSc in Computing Technology

CEG2136	Computer Architecture I	3
CEG3136	Computer Architecture II	3
CSI2372	Advanced Programming Concepts with C++	3
CSI3131	Operating Systems	3
ITI1100	Digital Systems I	3
MAT1348	Discrete Mathematics for Computing	3
Three credit	ts chosen from CSI, SEG or CEG courses) level or above	3

Engineering Management and Entrepreneurship Option

To follow the engineering management and entrepreneurship option, students must complete the following courses in addition to those required for the BASc in Chemical, Civil, Computer, Electrical, Mechanical or Software Engineering, or the BSc Honours in Computer Science.

The following courses are common to all programs with the engineering management and entrepreneurship option.

ADM1340	Financial Accounting	3
ADM2320	Marketing	3
ADM3313	Entrepreneurial Mind: New Venture Creation	3

BASc in Chemical Engineering,Engineering Management andEntrepreneurship Option132 credits

ADM1100 Introduction to Business Management

Students who complete this option will be exempted from two complementary studies electives and two technical electives required for the chemical engineering degree.

3

132 credits

BASc in Civil Engineering, Engineering Management and Entrepreneurship Option

ADM1100	Introduction to Business Management	3
CVG4173	Construction Management	3

Students who complete this option will be exempted from two complementary studies elective, one technical electives and two of the following courses: CVG4108, CVG4113, CVG4130, or CVG4148.

Students who complete the Environmental and Water resources option with the Engineering Management and Entrepreneurship option are exempted from two complementary studies electives, one technical elective, CHG3316, either CVG4113 or CVG4130, and either CHG 2317 or CVG 4133.

Students who also complete the Structural and Geotechnical Engineering option are exempted from two complementary studies electives, one technical elective, either CVG4108 or CVG4148, and either CVG 4145 or CVG 4143.

BASc in Computer Engineering, Engineering Management and Entrepreneurship Option

132 credits

Students who complete this option are exempted from three complementary study electives and two technical electives.

ADM1100	Introduction to Business Management	3
GNG4170	Engineering Law	3
Three credit	ts of management and entrepreneurship electives	3

List of management and entrepreneurship electives

Social Context of Business	3
Organizational Behaviour	3
International Business	3
Cross-Cultural Management	3
Advertising and Sales Promotion Management	3
Intellectual Property and Technology Law	
for Engineers	3
Business Ethics	3
	Social Context of Business Organizational Behaviour International Business Cross-Cultural Management Advertising and Sales Promotion Management Intellectual Property and Technology Law for Engineers Business Ethics

BSc Honours with Specialization in Computer Science, Management and Entrepreneurship Option 120 credits

Students who complete this option are exempted from the required courses CSI3130, CSI3140, and SEG3155 in the BSc honours with a specialization in computer science program. Students will have the following electives:

Three EECS credits at the 3000 level		
OR		
CSI2372 Advanced Programming Concepts with C++	3	
Nine CSI credits at the 4000 level	9	
12 credits of non-computing, non mathematical courses	12	
Eighteen credits of free elective courses		
ADM1100 Introduction to Business Management	3	
Three credits of management and entrepreneurship electives	з	

List of management and entrepreneurship electives

ADM 1101	Social Context of Business	3
ADM2336	Organization Behaviour	3
ADM3318	International Business	3
ADM3319	Cross-Cultural Management	3
ADM3326	Advertising and Sales Promotion Management	3
GNG4170	Engineering Law	3
PHI2397	Business Ethics	3

BASc in Electrical Engineering, **Engineering Management and** Entrepreneurship Option

Students who complete this option are exempted from three complementary studies electives required for the electrical engineering degree.

132 credits

ADM1100	Introduction to Business Management	3
GNG4170	Engineering Law	3
Three credit	ts of management and entrepreneurship electives	3

Three credits of management and entrepreneurship electives

List of management and entrepreneurship electives

ADM1101	Social Context of Business	3
ADM2336	Organizational Behaviour	3
ADM3318	International Business	3
ADM3319	Cross-Cultural Management	3
ADM3326	Advertising and Sales Promotion Management	3
PHI2397	Business Ethics	2

BASc in Mechanical Engineering, **Engineering Management and Entrepreneurship Option**

132 credits

Students who complete this option will be exempted from one complementary study elective and three technical electives.

Three credits of management and entrepreneurship electives 3

List of management and entrepreneurship electives

ADM1101	Social Context of Business	3
ADM2336	Organizational Behaviour	3
ADM3318	International Business	3
ADM3319	Cross-Cultural Management	3
ADM3326	Advertising and Sales Promotion Management	3
PHI2397	Business Ethics	3

BASc in Software Engineering. **Engineering Management and Entrepreneurship Option**

122	orodito
132	Credits

Students who complete this option are exempted from three technical electives and one complementary studies elective.

Three credits of management and entrepreneurship electives 3

List of management and entrepreneurship electives

ADM1101	Social Context of Business	3
ADM2336	Organizational Behaviour	3
ADM3318	International Business	3
ADM3319	Cross-Cultural Management	3
ADM3326	Advertising and Sales Promotion Management	3
GNG4170	Engineering Law	3
GNG4171	Intellectual Property and Technology Law for Engineers	3
PHI2397	Business Ethics	3





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The Honours BSc with specialization in Computer Science and the BASc in Software Engineering are accredited by the Computer Science Accreditation Council of CIPS



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