uOttawa

FACULTY OF
SCIENCE

science.uOttawa.ca

2024 PROGRAM GUIDE

FACULTY OF SCIENCE

Science is about exploring, questioning, discovering – opening your mind and pushing the boundaries of the unknown! If this is your passion, then our programs in the Faculty of Science will expand your knowledge and give you the tools needed for a rewarding career in natural sciences, life sciences, physical sciences or mathematics. All of our programs offer the opportunity to develop your fascination for science while receiving training that will equip you with the necessary skills to join the scientific work force or to pursue your education through research or professional programs.

There is no better time than now – join science's limitless future and be part of the impact!

Discover your passion for science!

A SETTING WHERE SCIENCE THRIVES

Nestled in the heart of Canada's Capital, we can tap directly into several government and private research centres, including the National Research Council (NRC) and several Government of Canada research laboratories.

The Faculty of Science boasts partnerships with researchers at Agriculture and Agri-Food Canada, Health Canada, Environment and Climate Change Canada, the Geological Survey of Canada, Natural Resources Canada, Statistics Canada, the Ottawa Hospital Research Institute, the Canadian Museum of Nature and the National Research Council Canada, to name a few.

DEDICATED PROFESSORS, RENOWNED RESEARCHERS

The Faculty of Science has more than 169 full-time professors who teach and lead cutting-edge research. On the strength of our national and international reputation, $35 million per year are awarded to our researchers in grants and research contracts. This funding represents an accolade for the Faculty's leadership in science and as an investment in our collective future. Our professors devotedly share their knowledge for research with their students, even beyond the classroom. The Faculty's professors consistently distinguish themselves in their teaching and their research, recognized to national and international heights. For more reasons why our Faculty is the place to study science, visit www2.uOttawa.ca/faculty-science/programs/undergraduate.

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CONTACT US

We can help you make the right decisions at the right time. If you have any questions or need information about admission, programs and course selections, please contact us:

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uOttawa
Faculté des sciences
Faculty of Science

For a closer look at all of our programs, facilities, and what life will be like as a science student, visit www2.uOttawa.ca/faculty-science/programs/undergraduate.

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YOUR SUCCESS IS OUR TOP PRIORITY

We know that transitioning from high school or CEGEP to university is a big step. The Faculty of Science offers many support programs for our new students.

Summer 2024

- **Science Preparatory Workshop** focuses on hands-on skills and services to give you every chance at achieving your full potential.
- **Math Workshop** reviews the material that you will need to succeed in your first-year math courses.

Beginning of the term

Early testing in class, and the interim grades are forwarded to the coordinator of the Faculty's Mentoring Centre.

Ongoing, every term

- Help Centres in Chemistry, Mathematics and Statistics, Physics.
- Free study groups for students registered in most of the first year and some second year courses. These groups will closely reflect the material learned in class each week and will give you an opportunity to work through problems that resemble evaluations and assignments.
- Contact our Mentoring Centre: the mentors are students from the Faculty of Science. With their support, you will acquire efficient learning strategies, learn to mobilize the resources at your disposal and develop time and stress-management tools as well as autonomy.
- They offer personalized one-on-one meetings at the Mentoring Centre, study groups for specific courses and skills development workshops to help you improve your academic performance. The office is open from Monday to Friday. For more information, consult www2.uOttawa.ca/faculty-science/student-life-services/mentoring-centre.

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1. The mentors can help you acquire learning strategies and efficient study techniques, reinforce your personal motivation, set academic goals, prepare a study plan for your exams and sharing mental health resources available for you.
2. Success in the classroom and in the lab depends a lot on the quality of the facilities. Ours are second to none.
3. Study groups are an excellent way for students to collaborate with their peers to help each other learn.

FOR MORE INFORMATION ON SUCCESS TOOLS, CONSULT:
www2.uOttawa.ca/faculty-science/student-life-services/science-101

World-class facilities

Our Science facilities consist of several buildings housing state-of-the-art equipment and laboratories. The world-class biosciences complex is just one example that offer our students additional opportunities to become the leaders of tomorrow. The complex houses teaching and research space and more than 40 faculty members in fields including biology, biochemistry, bioinformatics, biopharmaceutical science, biomedical science, environmental science, and genomics.

The complex comprises some of the best-equipped undergraduate biology and biochemistry teaching labs in Canada. The 200 biology workstations in 10 labs include top-of-the-line microscopes and digital imaging cameras and software. A digital network allows a lab instructor to broadcast images captured by one microscope to any or all workstations in the same room or even to other labs. Students can also retrieve images via the network to work on them at remote locations. This means that the lab experience can be extended outside the classroom.

The two biochemistry labs are outfitted with modern equipment where students are trained on the latest technologies, to better prepare them for their post-degree endeavours. The 56 stations have a network of screens (TVs) that allows us to include a multimedia approach in our teaching. Every year, there are investments in equipment and upgrades to enhance the learning experience.

The Earth Sciences microscopy laboratory is another example of the faculty's high quality teaching facilities. The principal component of this lab is a fleet of 18 Olympus BX-41 polarizing microscopes that are equipped for both transmitted and reflected light observation, the kind of state-of-the-art equipment normally only found in research labs.

Add to this our renovated chemistry laboratory, which can accommodate up to 180 students at once and allow students to perform open-ended, collaborative, research-style experiments using data acquisition technology.

The STEM (Science, Technology, Engineering, and Mathematics) Complex hosts the Department of Physics undergraduate teaching laboratories, with a total of 120 workstations distributed over nine learning spaces. First-year laboratories illustrate fundamental physics concepts with over a dozen distinct experiments that can be performed in parallel using 70 workstations. These experimental set-ups are equipped with state-of-the-art physical sensors interfaced with user-friendly software for data collection and analysis. Upper-level laboratories expose students to the cutting-edge research through tailored experiments performed in 50 multi-use workspaces and a suite of 10 dark rooms.

All of these facilities come together to create an outstanding science campus!

1. A view of the STEM Complex, Marion Hall and D'Iorio Hall from the canal

2. Two students working with a professor in the microbiology laboratory in the Biosciences Complex

3. Student in the Biosciences greenhouse

4. Aerial view of D'Iorio Hall and the Biosciences Complex

5. Student observing living cells with a confocal microscope

RESEARCH OPPORTUNITIES

Undergraduate Research Scholarship

A UNIQUE EXPERIENCE!

The Faculty of Science gives undergraduate students the opportunity to work with scientists and take part in important scientific discoveries. By obtaining the prestigious Undergraduate Research Scholarship (URS), you can live this unique experience.

This $11,500 award gives you the opportunity to work with one of our distinguished research groups in science or in medicine. You will earn $5,000 as a research assistant to one of our professors during the summer before your first year of studies. By succeeding in your first year of studies, you can continue your research the following summer, earning $6,500.

Assistantships are available in various areas of science and medicine: biochemistry, biology, biomedical science, biopharmaceutical science, biotechnology, chemistry, environmental geoscience, environmental science, geology, immunology, mathematics and statistics, microbiology, neurology, pharmacology, physics, physiology, virology.

Every year, scholarships are awarded to exceptional students from across the country. To qualify, you must be a Canadian citizen or a permanent resident, have an admission average of at least 92 per cent, be registered full-time for the first time in an undergraduate program of the Faculty of Science, and most importantly, demonstrate research skills and involvement in extracurricular activities of a scientific nature. To ensure renewal, you need a minimum grade point average of 8.5 in your first academic year.

Eligibility criteria and an application form are available on the Faculty's website. The deadline is **March 15th**.

Research opportunities and student initiatives:

Undergraduate Science Research Opportunity Program (USRO), SCINAPSE, Connecting Young Minds (CYM)…

Find out more at www2.uOttawa.ca/faculty-science/research-publications/research-opportunities-students

2023-2024 RECIPIENTS

Front row, left to right: Noor Trigui, Jenna Abu-Dieh, Kloé Rioux, Sydney Greenlaw, Julia Diem Hum, Emina Lai, Iniya Luckshman, Eva-Maria Abi-Nader.

Back row, left to right: Majd Al-Aarg, Tai Adewoye, Alexander Lee, Williams Thottungal, Émilien Roman, Joshua Gadza.

Missing: Ariane Lalonde

2022-2023 RECIPIENTS

Justin Bejjani
Collège catholique Franco-Ouest, Ottawa ON

Maria Chalhoub
Collège catholique Samuel-Genest, Ottawa ON

Jade Dupont-Clément
École Gabrielle-Roy, Surrey BC

Ghida Fawaz
Mother Theresa High School, Ottawa ON

Roxana Gorodnichy
École secondaire Louis-Riel, Ottawa ON

Ishaan Goswami
Bayview Glen, Toronto ON

Sophie Harb
Lycée Claudel, Ottawa ON

Hadi Hojeij
École secondaire publique Maurice-Lapointe, Ottawa ON

Luna Khayat
Grand Lycée Franco Libanais, Beirut

Nicholas Lafond
Collège catholique Samuel-Genest, Ottawa ON

Bryan Liu
Colonel By Secondary School, Ottawa ON

Bilal Siddiqi
Leaside High School, Toronto ON

Leila Smaili
École secondaire catholique Marie-Rivier, Kingston ON

Ryan Tu
Sir Robert Borden High School, Ottawa ON

Emilie Vezina
Sir James Dunn Collegiate and Vocational Institute, Sault Ste Marie ON

Lauren Wilkes
Collège catholique Franco-Ouest, Ottawa ON

EXPLORE THE WORLD

Start local: Meet people from all over the world on our multicultural campus.

Go global with uOGobal: Travel abroad and earn credits towards your degree.

Visit www2.uottawa.ca/current-students/uoglobal

COOP AND CAREER DEVELOPMENT

COOP PROGRAM

The University of Ottawa is home to one of Canada's most successful co-operative education programs. You will alternate study terms with work terms related to your area of study, allowing you to gain practical experience in the public or private sector as part of your undergraduate experience. At the Faculty of Science, all of our programs of study include the coop option, with the exception of Ophthalmic Medical Technology. By alternating four-eight or twelve-month paid work terms with your study terms, you apply your classroom knowledge in a real employment setting. In the end, you will have acquired up to 16 months of experience and given yourself a leg up in the search for your first full-time job. What's more, co-op placements are available throughout the globe – offering you a world of opportunities. The choice is yours!

SCIENTISTS WORK IN VARIOUS ECONOMIC SECTORS

Many interesting careers are available to students who complete their university education in science. Whether it is in life sciences or physical sciences, the array of careers is as vast as it is varied and the job perspectives are very promising. Scientists work in various economic sectors and they play a primary role in several aspects of our society. Very often, they are called upon to assume an important role in multidisciplinary teams where they work alongside doctors, engineers and other scientists from various fields. These days, it is not uncommon to see chemists, mathematicians, biochemists and physicists work side by side on the same project, or geologists, biologists and experts in environmental science pool their efforts and talents to resolve a problem.

FROM SCIENCE TO MEDICINE

Many students who choose a science program do so in order to pursue graduate and postgraduate studies, or to follow a professional path, whether it is in medicine, health sciences, education or law. A solid training in sciences remains the most popular route towards a career in medicine.

FROM GOOGLE, TO ENERGY, TO THE ENVIRONMENT, TO THE HUMAN GENOME

Scientists – they are all around us. Nevertheless, they are not always easy to spot because they often work in positions that are not considered to be strictly scientific, per se. For example, there are many mathematicians who work in the fields of aviation, computers, software design, telecommunications, cryptography, human genome and automobiles.

Sophie Paquin, recent environmental science graduate, observing a monarch butterfly on a milkweed flower as part of her internship in the Kharouba Lab.

Alysha Wenghofer is a biology student. Over a summer placement, she regularly visited agricultural sites surrounding the Ottawa area to take soil and water samples. At these sites, sondes were installed to measure the characteristics of the water flowing between farms into the South Nation Watershed. As water levels became low, it was time to crawl into the smelly and muddy ditch to remove the sondes. Any job can be fun when you have great coworkers cheering you on!

Physics also covers a vast range of fields of research, from the minuscule (atoms, molecules, nanostructures) to the infinitely immense (structures of the universe). So, it is not surprising that physicists are involved in a massive range of economic sectors: electronics, communications, medical physics, energy and the environment, defence and, obviously, the whole world of space exploration.

Scientists are at the heart of the big questions that concern us. Whether they are biologists, biochemists, geologists or chemists, they constantly deal with current issues and strive to find answers to the burning questions of the day. Why does Earth support life? What is the secret to beating cancer or viruses and other major diseases? How is climate changing? How can we better respect our environment?

FRENCH IMMERSION STREAM

The Faculty of Science offers you a chance to maintain your French skills and gain a clear advantage in the workplace. The French Immersion (FI) Stream gives you the opportunity to live it up *en français* on a bilingual campus in a bilingual region, and be one of over 2,350 Anglophone students at uOttawa taking part of their courses in French. In FI, one third of your courses are taught in French. You choose which courses you want to do in English and in French.

You are allowed to submit written work in either French or English in any non-language class you take. The FI option is available in almost all our programs.

Upon graduation, you obtain recognition of your accomplishment on your official University transcript and your diploma – tangible proof of your language skills.

WHAT'S IN IT FOR YOU?

- $1,000 annually for taking 2 courses in French each term.
- Access to campus jobs requiring bilingual skills.
- Boost your employability, particularly in the government sector and international jobs.
- Bilingual Canadians earn 10% more on average.

WE HAVE WHAT YOU NEED TO SUCCEED

- Science Help Centre for help with your science courses taught in French.
- Benefit from a wider selection of courses and greater flexibility to design your schedule.
- Experience Francophone culture through social activities!
- Enjoy conversation workshops and a writing centre to help you improve your French skills, along with student mentors for advice and support.
- Language support linked to the introduction chemistry (CHM) and biology (BIO) courses.

PROGRAM REQUIREMENTS AND REGULATIONS

- Admission as an Anglophone or Allophone student to your program of choice in English.
- Submitting proof of French proficiency (passing our Immersion Entry Test).
- Fulfillment of all the requirements of your program to graduate
- Complete at least 14 courses (42 units) taught in French, including:
    - A minimum of 2 courses (6 units) at the 1000 level;
    - A maximum of 4 courses (12 units) for accompanying courses (FLS 2581, FLS 3581, FLS 4581, FLS 4781), of which a maximum of 2 courses (6 units) for FLS 2581;
    - A minimum of 2 courses (6 units) at the 3000 or 4000 level, other than FLS.
- Successful completion of the University's Second Language Certification Test to ensure you are functionally bilingual.

For more information, consult immersion.uOttawa.ca.

RECOMMENDED COURSES

Based on the different disciplines, the following courses are recommended; a student who is admitted into a program without one of these recommended courses will have to complete a bridging course.

Past experience indicates that students with the most science prerequisites, including physics, biology and chemistry, have an increased rate of success.

DISCIPLINES	BIOCHEMISTRY, BIOLOGY, BIOPHARMACEUTICAL SCIENCE, ENVIRONMENTAL GEOSCIENCE, ENVIRONMENTAL SCIENCE, OPHTHALMIC MEDICAL TECHNOLOGY, BIOMEDICAL SCIENCE	CHEMISTRY, GEOLOGY-PHYSICS	GEOLOGY	PHYSICS, PHYSICS AND ELECTRICAL ENGINEERING, PHYSICS-MATHEMATICS	BIOTECHNOLOGY
Ontario	Biology 4U Chemistry 4U	Chemistry 4U Physics 4U	Chemistry 4U Earth and Space Science 4U Physics 4U	Chemistry 4U or Biology 4U Physics 4U	Biology 4U Chemistry 4U Physics 4U
Quebec-Cegep	Biology 101 (General Biology I) Chemistry 202 (General Chemistry or Organic Chemistry)	Chemistry 202 (General Chemistry or Organic Chemistry) Physics 203 (Mechanics or Electricity and Magnetism)	Chemistry 202 (General Chemistry or Organic Chemistry) Physics 203 (Mechanics or Electricity and Magnetism)	Chemistry 202 (General Chemistry or Organic Chemistry) or Biology 101 (General Biology I) Physics 203 (Mechanics or Electricity and Magnetism)	Biology 101 (General Biology I) Chemistry 202 (General Chemistry or Organic Chemistry) Physics 203 (Mechanics or Electricity and Magnetism)
New Brunswick	Biology 121 or 122 Chemisty 121 or 122	Chemistry 121 or 122 Physics 121 or 122	Chemistry 121 or 122 Physics 121 or 122	Chemistry121 or 122; or Biology 121 or 122 Physics 121 or 122	Biology 121 or 122 Chemistry 121 or 122 Physics 121 or 122
Nova Scotia	Biology 12 Chemistry 12	Chemistry 12 Physics 12	Chemistry 12 Physics 12	Chemistry 12 or Biology 12 Physics 12	Biology 12 Chemistry 12 Physics 12
Prince Edward Island	Biology 621 Chemistry 621	Chemistry 621 Physics 621	Chemistry 621 Physics 621	Chemistry 621 or Biology 621 Physics 621	Biology 621 Chemistry 621 Physics 621
Newfoundland and Labrador	Biology 3201 Chemistry 3202	Chemistry 3202 Physics 3204	Chemistry 3202 Physics 3204	Chemistry 3202 or Biology 3201 Physics 3204	Biology 3201 Chemistry 3202 Physics 3204
British Columbia / Yukon	Biology 12 Chemistry 12	Chemistry 12 Physics 12	Chemistry 12 Physics 12	Chemistry 12 or Biology 12 Physics 12	Biology 12 Chemistry 12 Physics 12
Alberta / NWT / Nunavut	Biology 30 Chemistry 30	Chemistry 30 Physics 30	Chemistry 30 Physics 30	Chemistry 30 or Biology 30 Physics 30	Biology 30 Chemistry 30 Physics 30
Saskatchewan	Biology 30 Chemistry 30	Chemistry 30 Physics 30	Chemistry 30 Physics 30	Chemistry 30 or Biology 30 Physics 30	Biology 30 Chemistry 30 Physics 30
Manitoba	Biology 40S Chemistry 40S	Chemistry 40S Physics 40S	Chemistry 40S Physics 40S	Chemistry 40S or Biology 40S Physics 40S	Biology 40S Chemistry 40S Physics 40S

ONTARIO

Applying for admission from an Ontario high school? Scan me for in-depth details about how we evaluate your file, how we calculate your minimum average and more.

You'll need:

- Ontario high school diploma*
- 4U-level program prerequisites*
- Six 4U-, 4M- or DU-level courses*
- Required minimum average**

*You can be in the process of obtaining these when you apply.

**Based on your six best interim or final grades in 4U, 4M or DU courses, including the prerequisites for your chosen program. This is also used to determine your eligibility for admission scholarships.

Past experience indicates that students with a strong background in biology, chemistry and physics have an increased rate of success. See list of recommended high school courses on page 9. Students who do not have Calculus and Vectors 4U can take the replacement course at the University either the summer before or during their first term.

DISCIPLINE	PREREQUISITES AND OTHER REQUIREMENTS	AVERAGE
Biochemistry **Biology** **Biopharmaceutical Science** **Chemistry** **Environmental Geoscience** **Environmental Science** **Geology** **Geology-Physics** **Ophthalmic Medical Technology** **Physics** **Physics-Mathematics**	• English 4U or *Français* 4U • Advanced Functions 4U • Calculus and Vectors 4U • Two of the following: Biology 4U, Chemistry 4U, Physics 4U, Earth and Space Science 4U • A minimum combined average of 70% is required for all prerequisite courses in science and mathematics.	Low 80s
Financial Mathematics and Economics (BSc) **Mathematics** **Mathematics and Economics (BSc)** **Statistics**	• English 4U or *Français* 4U • Advanced Functions 4U • Calculus and Vectors 4U • A minimum combined average of 70% is required for all prerequisite courses in mathematics.	High 70s to low 80s
Biomedical Science	• English 4U or *Français* 4U • Advanced Functions 4U • Calculus and Vectors 4U • Two of the following: Biology 4U, Chemistry 4U, Physics 4U, Earth and Space Science 4U • A minimum combined average of 70% is required for all prerequisite courses in science and mathematics.	Low to mid 80s
DUAL FAST-TRACK DEGREES	**PREREQUISITES AND OTHER REQUIREMENTS**	**AVERAGE**
Biochemistry (BSc) and Chemical Engineering (BASc) (Biotechnology)	• English 4U or *Français* 4U • Advanced Functions 4U • Calculus and Vectors 4U • Two of the following: Biology 4U, Chemistry 4U, Physics 4U, Earth and Space Science 4U • A minimum combined average of 70% is required for all prerequisite courses in science and mathematics	Mid 80s
Physics (BSc) and Electrical Engineering (BASc)	• English 4U or *Français* 4U • Advanced Functions 4U • Calculus and Vectors 4U • Chemistry 4U • Physics 4U • A minimum combined average of 70% is required for all prerequisite courses in science and mathematics.	

SAVE THE DATE FOR OUR OPEN HOUSES
For all upcoming events: www.uOttawa.ca/study/campus-tours-admissions-events

QUEBEC – SECONDARY V

Applying for admission from Secondary V? Scan me for in-depth details about how we evaluate your file, how we calculate your minimum average and more.

You'll need:

- **Quebec high school diploma***
- **Five Secondary V courses***
- **84% minimum average + program prerequisites****

*You can be in the process of obtaining this when you apply.
**Based on your five best interim or final grades in Secondary V courses, including the prerequisites for your chosen program. It is also used to determine your eligibility for admission scholarships.

Students may be required to take up to two mathematics make-up courses at the University either the summer before or during their first year.

DISCIPLINE	PREREQUISITES AND OTHER REQUIREMENTS	AVERAGE
Biochemistry **Biology** **Biomedical Science** **Biopharmaceutical Science** **Chemistry** **Environmental Geoscience** **Environmental Science** **Geology** **Geology-Physics** **Ophthalmic Medical Technology** **Physics** **Physics-Mathematics**	• English, Language Arts (Secondary V) or *Français, langue d'enseignement (Secondary V)* • Mathematics Technical and Scientific option or Science option (Secondary V) • Chemistry (Secondary V) • Physics (Secondary V) • Science and Technology (with or without option) (Secondary IV) • A minimum combined average of 84% is required for all Secondary V prerequisite courses in science and mathematics.	84%
Financial Mathematics and Economics (BSc) **Mathematics** **Mathematics and Economics (BSc)** **Statistics**	• English, Language Arts (Secondary V) or *Français, langue d'enseignement (Secondary V)* • Mathematics Technical and Scientific option or Science option (Secondary V) • A minimum combined average of 84% is required for all Secondary V prerequisite courses in mathematics	

DUAL FAST-TRACK DEGREES	PREREQUISITES AND OTHER REQUIREMENTS	AVERAGE
Biochemistry (BSc) and Chemical Engineering (BASc) (Biotechhology) **Physics (BSc) and Electrical Engineering (BASc)**	• English, Language Arts (Secondary V) or *Français, langue d'enseignement* (Secondary V) • Mathematics Technical and Scientific option or Science option (Secondary V) • Chemistry (Secondary V) • Physics (Secondary V) • Science and Technology (with or without option) (Secondary IV) • A minimum combined average of 84% is required for all Secondary V prerequisite courses in science and mathematics.	84%

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For all upcoming events: www.uOttawa.ca/study/campus-tours-admissions-events

QUEBEC – CEGEP

Your R score does not matter!

Applying for admission from CEGEP after successfully completing 12 or more courses

Scan me for in-depth details about how we evaluate your file, how we calculate your minimum average and more.

You'll need:

- **12 to 16 CEGEP courses,** excluding make-up courses
- **73% to 80% minimum average and prerequisites*****
- **You could qualify for advanced standing** Up to 15 units (5 courses)

Applying for admission from CEGEP after successfully completing 17 or more courses or with a DEC

You'll need:

- **17 or more CEGEP courses or DCS, excluding make-up courses**
- **65% to 78% minimum average and prerequisites*****
- **You could qualify for advanced standing** Up to 30 units (10 courses)

***Your admission average is also used to determine your eligibility for admission scholarships. Your R Score doesn't matter. If you're missing a CEGEP prerequisite but have completed its Secondary V equivalent, you must have a grade of 80% in this course and provide us with your official Achievement Record.

Past experience indicates that students with a strong background in biology, chemistry and physics have an increased rate of success. Students who are missing the mathematics prerequisite are required to take up to two replacement courses at the University the summer before or during their first year.

DISCIPLINE	PREREQUISITES AND OTHER REQUIREMENTS	AVERAGE
Biochemistry **Biology** **Biopharmaceutical Science** **Chemistry** **Environmental Geoscience** **Environmental Science** **Geology** **Geology-Physics** **Ophthalmic Medical Technology** **Physics** **Physics-Mathematics**	• English (603) or *Français* (601) • Mathematics (201) Calculus I • Two of the following: Biology (101) General Biology, Chemistry (202) General Chemistry or Organic Chemistry, Physics (203) Mechanics or Electricity and Magnetism, Mathematics (201) Algebra I • A minimum combined average of 70% is required for all prerequisite courses in science and mathematics.	Mid 60s
Financial Mathematics and Economics (BSc) **Mathematics** **Mathematics and Economics (BSc)** **Statistics**	• English (603) or *Français* (601) • Mathematics (201) Calculus I • A minimum combined average of 70% is required for the prerequisite course in mathematics.	
Biomedical Science	• English (603) or *Français* (601) • Mathematics (201) Calculus I • Two of the following: Biology (101) General Biology, Chemistry (202) General Chemistry or Organic Chemistry, Physics (203) Mechanics or Electricity and Magnetism, Mathematics (201) Algebra I • A minimum combined average of 70% is required for all prerequisite courses in science and mathematics.	High 70s

DUAL FAST-TRACK DEGREES	PREREQUISITES AND OTHER REQUIREMENTS	AVERAGE
Biochemistry (BSc) and Chemical Engineering (BASc) (Biotechnology)	• English (603) or *Français* (601) • Mathematics (201) Calculus I • Two of the following: Biology (101) General Biology, Chemistry (202) General Chemistry or Organic Chemistry, Physics (203) Mechanics or Electricity and Magnetism, Mathematics (201) Algebra I • A minimum combined average of 70% is required for all prerequisite courses in science and mathematics.	Low 70s
Physics (BSc) and Electrical Engineering (BASc)	• English (603) or *Français* (601) • Mathematics (201) Calculus I • Chemistry (202) General Chemistry or Organic Chemistry • Physics (203) Mechanics or Electricity and Magnetism • A minimum combined average of 70% is required for all prerequisite courses in science and mathematics.	

SAVE THE DATE FOR OUR OPEN HOUSES

For all upcoming events: www.uOttawa.ca/study/campus-tours-admissions-events

www2.uOttawa.ca/study/undergraduate-studies/cegep

MIX, MATCH AND COMBINE… BUILD YOUR OWN PROGRAM!

How do you choose what to study?

Find a subject that you're passionate about and will lead to your dream job. Take the time to explore the many disciplines offered at uOttawa Science. For more details beyond this guide, visit www2.uOttawa.ca/faculty-science/programs/undergraduate.

When do you choose?

For most programs, when you apply. You must indicate your choice of first discipline on the Ontario Universities' Application Centre (OUAC) form at **www.ouac.on.ca**. Once you are at the University, you can add a major or a minor, a microprogram, or change programs altogether.

Biology and history, physics and electrical engineering… How can you combine them?

Are you passionate about many subjects? Some programs allow you to add a second discipline to your bachelor's. You can even combine disciplines from different faculties.

Major, minor, specialization with option

What's the difference?

Two things are different: the total number of courses you must take in your first discipline and the option or the requirement to add a second discipline. To compare programs, see the diagram on the right.

An option is a set of courses in a given field that complements your main program and allows you to choose a more specific direction in your studies. A microprogram is a set of courses in one field to add to your main program.

HONOURS BACHELOR ACADEMIC PATHS

120 UNITS* = 4 YEARS

*Each successfully completed one-term course is worth 3 units (credits) per term towards your degree.

HONOURS (4 YEARS)

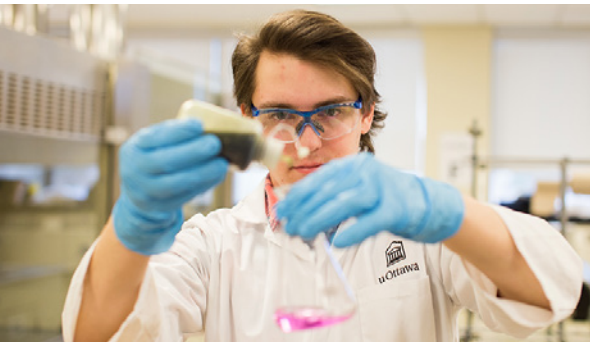
- H HONOURS + ELECTIVES
- HMn HONOURS + Mn MINOR + ELECTIVES
- HOpt HONOURS INCLUDING AN OPTION + ELECTIVES
- JH JOINT HONOURS – TWO DISCIPLINES LEADING TO ONE DEGREE + ELECTIVES

HONOURS DEGREE | DOUBLE MAJOR | MAJOR AND MINOR (4 YEARS)

- M MAJOR + M MAJOR + ELECTIVES
- M MAJOR + Mn MINOR + ELECTIVES

DD HONOURS DOUBLE DEGREE – INTEGRATED PATH LEADING TO TWO UNDERGRADUATE DEGREES (5 YEARS OR MORE)

HONOURS + HONOURS



UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc with specialization in Biochemistry[c]

Options: Chemical Biology[c], Microbiology and Immunology[c], Synthetic Biology[c]

Major in Biochemistry[c]

Minor in Biochemistry[cp]

[c]: Cooperative education is offered as part of four-year honours bachelor degrees.

[cp]: Complementary program offered only as a second discipline. Registration starts in second year.

GRADUATE PROGRAMS (MASTERS AND PhD)

Master of Science (MSc)

Doctorate (PhD)

CAREER OPPORTUNITIES

Biochemist • cell biologist • pharmacologist • synthetic biologist • forensic scientist • food microbiologist • brewmaster • doctor • laboratory technician • biochemical and biotechnological researcher • patent law specialist • science advisor

BIOCHEMISTRY

Biochemistry (BCH) is the chemistry of life. It provides the foundation for understanding all biological processes as well as the molecular basis and treatment of human disease.

The biochemistry program, offered through the Department of Chemistry and Biomolecular Sciences, provides the training needed to play a leading role in our continued quest to understand life, with impacts on medicine, biotechnology, food security, etc. You will be exposed to cutting-edge research and state-of-the-art knowledge. Thls undergraduate program prepares you for graduate studies, professional schools (e.g. medicine, dentistry, nursing, etc.), and a variety of public and private industries. A degree in biochemistry is a gateway to broad career options spanning academic research, large (e.g. pharmaceuticals) to small (e.g. biotech startups) companies in the private sector, or in the public service to shape public policy and governance of health, agriculture, and the environment.

You can enroll in a BSc with specialization, a major, or a minor in biochemistry. Choose the specialization if you want to pursue a career in experimental biochemistry. Opt for the major if you prefer fundamental training in the discipline. Choose the minor if you are focusing on another discipline but are interested in biochemistry. Additional options in chemical biology (manipulating life with chemical tools), microbiology and immunology, and synthetic biology (manipulating life with genetic approaches) are also available. By enrolling in the Biotechnology dual fast-track degree, you can choose to combine studies in biochemistry with training in chemical engineering to obtain both a BSc in biochemistry and a BASc in chemical engineering over five years.

A benefit of the specialization program is the opportunity to complete a full-year research project under the supervision of a professor. You can pursue work in many areas of modern biochemical research, including microbiology, immunology, chemical biology, synthetic biology, molecular biology, cell biology and signalling, molecular pathogenesis, cancer biology, proteomics, genomics, systems biology and bioinformatics.

LUKE PAQUETTE , 4TH YEAR

I enrolled in the Biochemistry program to accumulate knowledge. In the program, you get a taste for all sorts of different subjects: biology, chemistry, physics, mathematics, just to name a few. Hence, you become well-versed in multiple areas enabling you to be ready for a future job in many different sectors. It also offers the possibility to complete an honours project where you get to participate actively in scientific research and leave your mark as an undergraduate. Not to mention you also get the opportunity to work alongside budding graduate students and professors from whom you learn a ton.

HONOURS BSc IN BIOCHEMISTRY (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 optional course units in ENG at the 1000 or 2000 level	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2132 Physical Chemistry for the Life Sciences MAT2379 Introduction to Biostatistics 3 elective course units	BCH3170 Molecular Biology BCH3356 Molecular Biology Laboratory BIO3153 Cell Biology 6 elective course units	BCH4932 Biochemistry Seminar BCH4040 Honours Research - Biochemistry or 3 course units from: BPS4104 Bioinformatics Laboratory (Winter) BPS4127 Advanced Techniques in Biosciences Plus 6 course units in science at the 3000 or 4000 level 6 course units from (Fall or Winter): BCH4124 Carbohydrates and Glycobiology (Winter) BCH4188 Nucleic Acids - Structure and Functions BPS3101 Genomics BCH4101 Human Genome Structure and Function BCH4125 Cellular Regulation and Control 3 elective course units
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II PHY1322 Principles of Physics II or PHY2325 Physics in Biology (Winter of 2nd year) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH2333 Introduction to Biochemistry BIO2133 Genetics CHM2354 Analytical Chemistry 3 elective course units 3 elective units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH3120 General Intermediary Metabolism BCH3125 Protein Structure and Function BCH3346 Biochemistry Laboratory II 3 elective course units 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH4116 Analytical Biochemistry BCH4122 Structural Biology of Proteins BCH4932 Biochemistry Seminar BCH4040 Honours Research - Biochemistry or 3 course units from: BPS4104 Bioinformatics Laboratory BCH4126 Structural Biology of Membranes BPS4127 Advanced Techniques in Biosciences (Fall) Plus 6 course units in science at the 3000 or 4000 level 3 course units from (Fall or Winter): BCH4123 Pathological Biochemistry (Winter) BCH4172 Topics in Biotechnology BCH4300 Selected topics in Biochemistry (Winter) BPS4129 Advanced Chemical Biology (Winter) CHM4139 Enzyme Chemistry and Biocatalysis (Fall)

Notes BIO1109: beyond the requirements of the programs in science. | BCH4040 (9 units) is highly recommended. A minimum CGPA of 6.5 is required. | Certain courses may not be available every year. | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace the units with electives. | Certain courses are only offered in English once every second year (it is offered in French opposite years). | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOCHEMISTRY - CHEMICAL BIOLOGY OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 optional course units in ENG at the 1000 or 2000 level	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2132 Physical Chemistry for the Life Sciences MAT2379 Introduction to Biostatistics 3 elective course units	BCH3170 Molecular Biology BCH3356 Molecular Biology Laboratory BIO3153 Cell Biology CHM3120 Intermediate Organic Chemistry CHM3122 Applications of Spectroscopy in Chemistry	BCH4932 Biochemistry Seminar BCH4040 Honours Research - Biochemistry or 3 course units from: BPS4104 Bioinformatics Laboratory (Winter) BPS4127 Advanced Techniques in Biosciences Plus 6 course units in science at the 3000 or 4000 level (Fall or Winter) 9 elective course units
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II PHY1322 Principles of Physics II or PHY2325 Physics in Biology (Winter of 2nd year) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH2333 Introduction to Biochemistry BIO2133 Genetics CHM2354 Analytical Chemistry 3 elective course units 3 elective units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH3120 General Intermediary Metabolism BCH3125 Protein Structure and Function BCH3346 Biochemistry Laboratory II 3 elective course units 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH4116 Analytical Biochemistry BPS4129 Advanced Chemical Biology BCH4932 Biochemistry Seminar BCH4040 Honours Research -Biochemistry or 3 course units from: BPS4104 Bioinformatics Laboratory BPS4127 Advanced Techniques in Biosciences (Fall) Plus 6 course units in science at the 3000 or 4000 level (Fall or Winter) 3 course units from (Fall or Winter): BCH4101 Human Genome Structure and Function (Fall) BCH4122 Structural Biology of Proteins (Winter) BCH4124 Carbohydrates and Glycobiology (Winter) BCH4125 Cellular Regulation and Control (Winter) BCH4126 Structural Biology of Membranes

Notes BIO1109: beyond the requirements of the programs in science. | BCH4040 is highly recommended. A minimum CGPA of 6.5 is required. | **For students registered in the Faculty of Science:** If the components of your program of study require common compulsory courses, you will have to replace the units with electives. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOCHEMISTRY - MICROBIOLOGY AND IMMUNOLOGY OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 optional course units in ENG at the 1000 or 2000 level	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2132 Physical Chemistry for the Life Sciences MAT2379 Introduction to Biostatistics 3 elective course units	BCH3170 Molecular Biology BCH3356 Molecular Biology Laboratory BIO3124 General Microbiology BIO3126 General Microbiology Laboratory BIO3153 Cell Biology	BCH4932 Biochemistry Seminar BCH4040 Honours Research - Biochemistry or 3 course units from: BPS4104 Bioinformatics Laboratory (Winter) BPS4127 Advanced Techniques in Biosciences Plus 6 course units in science at the 3000 or 4000 level MIC4125 Immunology 6 elective course units
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II PHY1322 Principles of Physics II or PHY2325 Physics in Biology (Winter of 2nd year) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH2333 Introduction to Biochemistry BIO2133 Genetics 6 elective course units 3 elective units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH3120 General Intermediary Metabolism BCH3125 Protein Structure and Function BCH3346 Biochemistry Laboratory II 3 elective course units 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH4932 Biochemistry Seminar BCH4040 Honours Research -Biochemistry or 3 course units from: BPS4104 Bioinformatics Laboratory BPS4127 Advanced Techniques in Biosciences (Fall) Plus 6 course units in science at the 3000 or 4000 level MIC4124 Pathogenic Bacteriology MIC4126 Virology 3 course units from the list of optional courses below

Notes BIO1109: course is beyond the requirements of the programs in science. | List of optional courses: BCH4101, BCH4122, BCH4123, BCH4124, BCH4125, BCH4126, BCH4172, BCH4188, BCH4300, BPS3101, BPS4129, CHM4139 | BCH4040 (9 units) is highly recommended. A minimum CGPA of 6.5 is required. | Certain courses may not be available every year. | Certain courses are only offered in English once every second year (it is offered in French opposite years). | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace with electives. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOCHEMISTRY - SYNTHETIC BIOLOGY OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 optional course units in ENG at the 1000 or 2000 level	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2132 Physical Chemistry for the Life Sciences MAT2379 Introduction to Biostatistics 3 elective course units	BCH3170 Molecular Biology BCH3356 Molecular Biology Laboratory BIO3124 General Microbiology 6 elective course units	BCH4932 Biochemistry Seminar BCH4172 Topics in Biotechnology CHM4139 Enzyme Chemistry and Biocatalysis (Fall) or BCH4124 Carbohydrates and Glycobiology (Winter) BCH4040 Honours Research - Biochemistry or 3 course units from: BPS4104 Bioinformatics Laboratory(Winter) BPS4127 Advanced Techniques in Biosciences Plus 6 course units in science at the 3000 or 4000 level 3 course units from (Fall or Winter): BCH4101 Human Genome Structure and Function BCH4123 Pathological Biochemistry BCH4125 Cellular Regulation and Control BCH4126 Structural Biology of Membranes BCH4300 Selected topics in Biochemistry BPS3101 Genomics BPS4129 Advanced Chemical Biology
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II PHY1322 Principles of Physics II or PHY2325 Physics in Biology (Winter of 2nd year) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH2333 Introduction to Biochemistry BIO2133 Genetics 6 elective course units 3 elective units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH3120 General Intermediary Metabolism BCH3125 Protein Structure and Function BCH3346 Biochemistry Laboratory II 3 elective course units 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH4932 Biochemistry Seminar BCH4040 Honours Research -Biochemistry or 3 course units from: BPS4104 Bioinformatics Laboratory BPS4127 Advanced Techniques in Biosciences (Fall) Plus 6 course units in science at the 3000 or 4000 level BCH4122 Structural Biology of Proteins BCH4188 Nucleic Acids - Structure and Functions 3 course units from (Fall or Winter): BCH4101 Human Genome Structure and Function BCH4123 Pathological Biochemistry BCH4125 Cellular Regulation and Control BCH4300 Selected topics in Biochemistry BPS3101 Genomics BPS4129 Advanced Chemical Biology

Notes BIO1109: beyond the requirements of the programs in science. | BCH4040 is highly recommended. A minimum CGPA of 6.5 is required. | Certain courses may not be available every year. | Certain courses are only offered in English once every second year (it is offered in French opposite years). | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace with electives. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

MAJOR IN BIOCHEMISTRY (60 UNITS)

	1ST YEAR (24 units)	2ND YEAR (15 units)	3RD YEAR (15 units)	4TH YEAR (6 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	CHM2120 Organic Chemistry II CHM2132 Physical Chemistry for the Life Sciences MAT2379 Introduction to Biostatistics	BCH3170 Molecular Biology BCH3356 Molecular Biology Laboratory	6 units from (Fall or Winter): BCH4101 Human Genome Structure and Function BCH4116 Analytical Biochemistry BCH4122 Structural Biology of Proteins BCH4123 Pathological Chemistry BCH4124 Carbohydrates and Glycobiology BCH4125 Cellular Regulation and Control BCH4172 Topics in Biotechnology BCH4188 Nucleic Acids - Structure and Functions BCH4300 Selected Topics in Biochemistry BPS3101 Genomics BPS4129 Advanced Chemical Biology CHM4139 Enzyme Chemistry and Biocatalysis
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II PHY1322 Principles of Physics II or PHY2325 Physics in Biology (Winter of 2nd year)	BCH2333 Introduction to Biochemistry BIO2133 Genetics	BCH3120 General Intermediary Metabolism BCH3125 Protein Structure and Function BCH3346 Biochemistry Laboratory II	

Notes BIO1109: beyond the requirements of the programs in science. | BCH4101, BCH4122, BCH4125, BPS3101: A maximum of 3 course units may be selected amongst these courses. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available when taken as part of an honours degree. | Certain courses may not be available every year. | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace the units with electives.

MINOR IN BIOCHEMISTRY (39 UNITS)

	1ST YEAR (12 units)	2ND YEAR (9 units)	3RD YEAR (12 units)	4TH YEAR (6 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed)	CHM2120 Organic Chemistry II	BCH3170 Molecular Biology 3 course units from the list below	3 course units from the list below
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I	BCH2333 Introduction to Biochemistry BIO2133 Genetics	BCH3120 General Intermediary Metabolism BCH3125 Protein Structure and Function	3 course units from the list below

Notes BIO1109: beyond the requirements of the programs in science. | Certain courses may not be available every year. | At least 9 course units from the following list must be completed: BCH3346, BCH3356, BCH4101, BCH4122, BCH4125, BIO3124, BIO3153, BPS3101, CHM2132, MAT2379, 3 optional course units in BCH at the 4000 level, 3 optional course units in MIC at the 4000 level.

Photo: B. Charbonneau, uOttawa Science

BIOCHEMISTRY AND CHEMICAL ENGINEERING (BIOTECHNOLOGY)

Learn how living organisms grow and develop, and how we can use this knowledge to create manufacturing processes, chemical products, or life-saving drugs.

Did you know that cheese, yogurt, and beer are all biotechnology products? So are insulin and the COVID-19 vaccines, both of which have saved or improved the lives of millions.

The biotechnology program covers the areas of biology, chemistry, mathematics, engineering and more. Students in this program, offered jointly through the Departments of Chemistry and Biomolecular Sciences and Chemical and Biological Engineering, obtain two degrees upon graduation, a BSc in biochemistry and a BASc in chemical engineering. Students in this dual fast-track degree combine the know-how of a biochemical approach to life sciences with the engineering skills required to innovate the industrialization of these processes.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Biochemistry / BASc in Chemical Engineering (Biotechnology)[c]

[c]: Cooperative education is offered as part of an honours bachelor degree.

GRADUATE PROGRAMS (MASTERS AND PhD)

Master and doctorate in allied disciplines.

CAREER OPPORTUNITIES

Biotechnologist • biomedical engineer • biochemist • pharmaceutical researcher • chemical engineer • patent law specialist • quality control engineer

HONOURS BSc IN BIOCHEMISTRY / BASc IN CHEMICAL ENGINEERING (BIOTECHNOLOGY)
(189 UNITS)

	1ST YEAR (36 units)	2ND YEAR (33 units)	3RD YEAR (36 units)	4TH YEAR (48 units)	5TH YEAR (36 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHG1125 Chemical Engineering Fundamentals CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GNG1103 Engineering Design MAT1320 Calculus I PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II ENG1112 Technical Report Writing (Fall or Winter) MAT2384 Ordinary Differential Equations and Numerical Methods HIS2129 Technology, Society and Environment since 1800 or PHI2394 Scientific Thought and Social Values	BCH3170 Molecular Biology BCH3356 Molecular Biology Laboratory BIO3124 General Microbiology BIO3153 Cell Biology CHG2312 Fluid Flow CHG2317 Introduction to Chemical Process Analysis and Design	BCH4040 Honours Research – Biochemistry (Fall and Winter) BCH4172 Topics in Biotechnology BCH4932 Biochemistry Seminar (Fall and Winter) CHG3127 Chemical Reaction Engineering CHG3316 Transport Phenomena CHG3305 Advanced Materials in Chemical Engineering CHG3335 Process Control	CHG3337 Data Collection and Interpretation CHG4116 Chemical Engineering Laboratory CHG4343 Computer-Aided Design in Chemical Engineering CHG4381 Biochemical Engineering CHG4900 Thesis and seminars (Fall or Winter) or 6 course units of technical electives 3 course units of technical electives (Fall or Winter)
WINTER	BIO1140 Introduction to Cell Biology CHG1371 Numerical Methods and Engineering Computation in Chemical Engineering CHM1321 Organic Chemistry I MAT1322 Calculus II MAT1341 Introduction to Linear Algebra (Winter or Summer) PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed)	BCH2333 Introduction to Biochemistry BIO2133 Genetics CHM2330 Physical Chemistry: Introduction to the Molecular Properties of Matter CHM2354 Analytical Chemistry ECO1192 Engineering Economics (Fall or Winter) or GNG2101 Introduction to product development and management for engineers and computer scientists (Fall or Winter) 3 course units of complementary studies electives (Fall or Winter)	BCH3120 General Intermediary Metabolism BCH3125 Protein Structure and Function BCH3346 Biochemistry Laboratory II CHG2314 Heat Transfer Operations CHG2324 Fundamentals and Applications of Chemical Engineering Thermodynamics MAT2322 Calculus III for Engineers (Fall or Winter)	BCH4040 Honours Research – Biochemistry (Fall and Winter) BCH4932 Biochemistry Seminar (Fall and Winter) 6 course units from: BPS3101 Genomics (Fall) or BCH4101 Human Genome Structure and Function (Fall) or BCH4125 Cellular Regulation and Control (Winter) BCH4116 Analytical Biochemistry (Winter) BCH4122 Structural Biology of Proteins (Winter) BCH4123 Pathological Chemistry (Winter) BCH4124 Carbohydrates and Glycobiology (Winter) BCH4188 (Fall) Nucleic Acids – Structure and Functions (Fall) BCH4300 Selected Topics in Biochemistry BPS4121 Biosynthesis and Natural Product Derived Medicines (Fall) BPS4129 Advanced Chemical Biology (Winter) CHM4139 Enzyme Chemistry and Biocatalysis (Fall)	CHG4250 Plant Design Project CHG4307 Clean Processes and Sustainable Development GNG4170 Engineering Law
SUMMER				CHG3111 Unit Operations CHG3112 Process Synthesis, Design and Economics CHG3122 Chemical Engineering Practice CHG3326 Principles of Phase Equilibria and Chemical Reaction Equilibria 3 course units of complementary studies electives	

Notes BIO1109: beyond the requirements of the programs in science. | CHG1125 must be taken during the first or second year; first year is recommended. | BCH4040 and BCH4932 runs from September to April. | BCH4188 and BCH4300: These courses may not be available every year. | BCH4040: During the fourth year, the student must either do a research project (BCH4040), or take nine additional units among the 3000 or 4000 level courses in biochemistry (BCH), biology (BIO), biopharmaceutical sciences (BPS), cellular and molecular medicine (CMM), chemistry (CHM), pharmacology (PHA), physiology (PHS), microbiology or immunology (MIC). The research project is highly recommended for students who intend to pursue a career in research, but a CGPA of 6.5 is required to be eligible for the project. This course runs from September to April. | Course units of complementary studies electives: For a complete list of complementary studies electives, consult the Faculty of Engineering's website. | Course units of technical electives: Consult the list of technical electives in the regular Chemical Engineering program. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 6.0.

AUTUMN SHAW, 4TH YEAR

The unique Biotechnology dual fast-track degree program offered at the University of Ottawa opens numerous doors to career paths within both fields of science and engineering. As someone who loves problem solving, designing, and working in a laboratory setting, this program was the perfect fit for me. It allowed me to understand the science behind the manufacturing of products with the technical background to be able to design a system to produce these products.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Biology[c, rf]

Options: Cellular/Molecular[c, rf], Ecology/Evolution/Behaviour[c, rf] , Animal Physiology[c, rf], Plant Science [c, rf]

Major in Biology[c]

Minor in Biology[cp]

[c]: Cooperative education is offered as part of four-year honours bachelor degrees.

[cp]: Complementary program offered only as a second discipline. Registration starts in second year.

[rf]: Research Focus available starting in 3rd year

GRADUATE PROGRAMS (MASTERS AND PhD)

Master of Science (MSc)

Doctorate (PhD)

CAREER OPPORTUNITIES

Assessment officer (conservation, risk management) • wildlife biologist • research assistant in university, government or industry laboratory • consultant • policy analyst • microbiologist • forensic scientist • ecotoxicologist • science writer • educator (elementary, secondary, college, university) • laboratory technician • MSc and PhD programs • MD and paramedical programs

BIOLOGY

Recent discoveries and new technologies are revolutionizing the biological sciences, which increasingly require integrating knowledge across the full range of biological systems, from the gene to entire ecosystems.

Our biology (BIO) programs give students both the intellectual tools and the experience they need to generate new knowledge and contribute to debates on issues as diverse as stem cell research, land management, conservation and endangered species, genetically modified organisms as well as disease management and prevention.

The program offers different learning methods: traditional classroom instruction with field trips, innovative laboratory projects using state-of-the-art technologies and basic research with individual mentoring.

The honours in biology involves in-depth study of one or more biology subdisciplines. You can choose a broad focus or zero in on one of the four options (cellular and molecular biology; ecology, evolution and behaviour; animal physiology; or plant science). There's also a compulsory independent research component designed to hone your critical analysis and communication skills while preparing you for graduate studies. Students who are thinking of a career in research may wish to consider the Research Focus, an immersive research experience at the third and fourth year levels.

The major in biology introduces you to cell biology, genetics, evolution, ecology, animal physiology, and plant science, and in combination with another major or minor, opens the way to graduate studies or to a career in the life sciences.

The minor in biology is a flexible program that allows students to select a subset of biology courses.

HONOURS BSc IN BIOLOGY (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 course units in ENG at the 1000 or 2000 level	BIO2129 Ecology BIO2137 Introduction to Plant Science: Biodiversity to Biotechnology CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics 3 elective course units	3 optional course units in BIO, BPS, EVS, ITI1120, BCH3120, BCH3125, BCH3356 or SCI3101, BCH4122, BCH4125, BCH4188 6 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356 or SCI3101, BCH4122, BCH4125, BCH4188 6 elective course units	BIO4920 Seminar I 6 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356 or SCI3101, BCH4122, BCH4125, BCH4188 9 elective course units
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II 3 elective course units	BCH2333 Introduction to Biochemistry BIO2133 Genetics BIO2135 Animal Form and Function 3 optional course units in BIO, BPS, EVS, ITI1120, BCH3120, BCH3125, BCH3356 or SCI3101, BCH4122, BCH4125, BCH4188 3 elective course units	3 optional course units in BIO, BPS, EVS, ITI1120, BCH3120, BCH3125, BCH3356 or SCI3101, BCH4122, BCH4125, BCH4188 6 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356 or SCI3101, BCH4122, BCH4125, BCH4188 6 elective course units	BIO4921 Seminar II 9 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356 or SCI3101, BCH4122, BCH4125, BCH4188 3 elective course units

Notes BIO1109: beyond the requirements of the programs in science. | Within your program of study, you must complete a minimum of 12 units at the 3000 or 4000 level with a laboratory component. These courses must be selected from the list of optional courses: BIO3103, BIO3126, BIO3137, BIO3146, BIO3151, BIO3152, BIO3154, BIO3158, BIO3310, BIO3333, BIO3360, BIO3924, BIO4004, BIO4009, BIO4122, BIO4150, BIO4156, BIO4158, BIM4316, BPS4104, BPS4127 | At least 9 of the 33 elective course units must be from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management | In addition to the regular honours with specialization program, four other honours with specialization options are available: 1) Cellular and Molecular Option; 2) Ecology, Evolution and Behaviour Option; 3) Animal Physiology Option; 4) Plant Science Option. Please consult the relevant table for each of these options. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOLOGY - CELLULAR / MOLECULAR OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 course units in ENG at the 1000 or 2000 level	BIO2129 Ecology BIO2137 Introduction to Plant Science: Biodiversity to Biotechnology CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics 3 elective course units	BIO3153 Cell Biology BIO3170 Molecular Biology 3 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101 3 course units from the list A below (Fall or Winter) 3 elective course units	BIO4009 Honours Research (Fall and Winter) BIO4920 Seminar I 3 course units from list A below (Fall or Winter) 3 optional course units in BIO, BPS, EVS, ITI1120, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101 3 elective course units
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II 3 elective course units	BCH2333 Introduction to Biochemistry BIO2133 Genetics BIO2135 Animal Form and Function 6 elective course units	BIO3151 Molecular Biology Laboratory or BIO3152 Cell Biology Laboratory 6 optional course units in BIO, BPS, EVS, ITI1120, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101 6 elective course units	BIO4009 Honours Research BIO4921 Seminar II 9 elective course units

Notes A minimum of 15 units in BIO at the 3000-level or above with a lab component must be completed from this list: BIO3103 BIO3126 BIO3137 BIO3146 BIO3151 BIO3152 BIO3154 BIO3158 BIO3310 BIO3333 BIO3360, BIO3924 BIO4004 BIO4009 BIO4122 BIO4150 BIO4156 BIO4158 BIM4316 BPS4104 BPS4127 | List A: 6 units from the following list must be completed: BCH3120 BCH4172 BIO3102 BIO3119 BIO3124 BIO3126 BIO3142 BIO3147 BIO3360, BIO4115 BIO4142 BIO4144 BIO4145 BIO4158 BIO4175 BIO4537 BPS3101 BPS4104 | BIO1109: This course is beyond the requirements of the programs in science. | At least 9 of the 33 elective units must be from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management. | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace the units with electives. | Co-operative education is available with this program. The French Immersion Stream is available with this program. The minimum CGPA required to be on good academic standing is 5.0. Please note that a maximum of 48 units at the 1000 level can be used towards your program.

J. Kerr, uOttawa Science

HONOURS BSc IN BIOLOGY - ECOLOGY / EVOLUTION / BEHAVIOUR OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 course units in ENG at the 1000 or 2000 level	BIO2129 Ecology BIO2137 Introduction to Plant Science: Biodiversity to Biotechnology CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics 3 elective course units	3 optional course units from list A below (Fall or Winter) 3 optional course units in BIO, BPS, EVS, ITI1120, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101 (Fall or Winter) 6 elective course units BIO3122 Evolutionary Biology	BIO4009 Honours Research BIO4920 Seminar I BIO4158 Applied Biostatistics 3 optional course units in biology (BIO), biopharmaceutical science (BPS), or environmental science (EVS) at the 3000 or 4000 level BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101 3 elective course units
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II 3 elective course units	BCH2333 Introduction to Biochemistry BIO2133 Genetics BIO2135 Animal Form and Function 6 elective course units	3 optional course units in BIO, BPS, EVS, ITI1120, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101 (Fall or Winter) 12 elective course units	BIO4009 Honours Research BIO4921 Seminar II 6 optional course units from list A below (Fall or Winter) 3 optional course units in BIO, BPS, EVS, ITI1120, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101

Notes BIO1109: beyond the requirements of the programs in science. | List A: Optional courses in Ecology/Evolution/Behaviour - 9 course units from this list must be taken: BIO3102, BIO3103, BIO3115, BIO3117, BIO3119, BIO3146, BIO3154, BIO3176, BIO3310, BIO3360, BIO3924, BIO4111, BIO4122, BIO4146, BIO4150, BIO4156, BIO4159, BIO4537, BIO4551 | Some 3000-4000 level lecture courses are offered in alternating years with the French equivalent. | Within your program of study, you must complete a minimum of 15 course units at the 3000 or 4000 level with a laboratory component. A complete list of courses having a laboratory component can be found below. Please note: if a course listed below has already been used to fulfill a compulsory or optional requirement in your program listed above, these course units count towards this total of 15 units. | List of optional courses with a laboratory component: BIM4316, BIO3103, BIO3126, BIO3137, BIO3146, BIO3151, BIO3152, BIO3154, BIO3158, BIO3310, BIO3333, BIO3360, BIO3924, BIO4004, BIO4009, BIO4122, BIO4150, BIO4156, BIO4158, BPS4104, BPS4127 | At least 9 of the 33 elective course units must be from the faculties of Arts, Education, Law, Social Science or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOLOGY - ANIMAL PHYSIOLOGY OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 course units in ENG at the 1000 or 2000 level	BIO2129 Ecology BIO2137 Introduction to Plant Science: Biodiversity to Biotechnology CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics 3 elective course units	BIO3137 Experiments in Animal Physiology BIO3302 Animal Physiology II BIO3305 Cellular Physiology 6 elective course units	BIO40091 Honours Research BIO4920 Seminar I 6 course units from (Fall or Winter; may be taken in 3rd or 4th year): BCH3120 General Intermediary Metabolism BIO3350 Principles of Neurobiology BIO3360 Computational Tools for Biological Sciences BIO4119 Topics in Respiratory Physiology BIO4120 Animal Adaptations BIO4127 Comparative Endocrinology BIO4152 Animal Energetics BIO4158 Applied Biostatistics BIO4175 Membrane Physiology BIO4302 Animal Movement BIO4351 Neural Basis of Animal Behaviour BIO4551 Physiologie évolutive et écophysiologie BPS3102 Principles of Toxicology and Pharmacology CMM4360 The Dynamical Brain: Experimental and Computational Approaches to Neural Networks 3 elective course units
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II 3 elective course units	BCH2333 Introduction to Biochemistry BIO2133 Genetics BIO2135 Animal Form and Function 6 elective course units	6 optional course units in BIO, BPS, EVS, BCH3120, BCH3125, BCH3356, BIO3303 Animal Physiology I BCH4122, BCH4125, BCH4188, ITI1120 or SCI3101 with at least 3 course units at the 3000 or 4000 level 6 elective course units (Fall or Winter)	BIO40092 Honours Research BIO4921 Seminar II 6 elective course units (Fall or Winter) 3 course units from (Fall or Winter; may be taken in 3rd or 4th year): BIM 4316 Modern Bioanalytical Chemistry BIO 3103 Field Biology BIO 3126 General Microbiology Laboratory BIO 3146 Ecophysiology of Plants BIO 3151 Molecular Biology Laboratory BIO 3152 Cell Biology Laboratory BIO 3154 Population and Community Ecology BIO 3158 Vertebrate Zoology BIO 3310 Plant Systematics and Diversity BIO 3333 Entomology BIO 3360 Computational Tools for Biological Sciences BIO 3924 Biology of Algae and Fungi BIO 4004 Honours Research BIO 4122 Experiments in Animal Behaviour BIO 4150 Spatial Ecology BIO 4156 Freshwater Ecology BIO 4158 Applied Biostatistics BPS 4104 Bioinformatics Laboratory BPS 4127 Advanced Techniques in Biosciences 6 elective course units (Fall or Winter)

Notes BIO1109: beyond the requirements of the programs in science. | Within your program of study, you must complete a minimum of 15 course units at the 3000 level or above with laboratory component. These courses must be selected from the list of optional courses: BIM4613, BIO3103, BIO3126, BIO3137, BIO3146, BIO3151, BIO3152, BIO3154, BIO3158, BIO3310, BIO3333, BIO3360, BIO3924, BIO4004, BIO4007, BIO4122, BIO4150, BIO4156, BIO4158, BPS4104, BPS4127 | At least 9 of the 33 elective course units must be from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management | Certain courses are offered in alternating years with the French equivalent. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0. | Certain courses are offered in alternate years with the French equivalent.

HONOURS BSc IN BIOLOGY - PLANT SCIENCE OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry (or CHM1301 if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I (or PHY1331 if 4U Physics not completed) 3 course units in English (ENG) at the 1000 or 2000 level	BIO2129 Ecology BIO2137 Introduction to Plant Science CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics 3 elective course units	BIO3140 Plant Physiology and Biochemistry BIO3310 Plant Systematics and Diversity 9 elective course units (Fall or Winter)	BIO40091 Honours Research BIO4920 Seminar I Evaluating Science 9 course units from (Fall or Winter; may be taken in 3rd or 4th year): BCH3120 General Intermediary Metabolism BIO 3146 Ecophysiology of Plants BIO 3360 Computational Tools for Biological Sciences BIO3128 Biology of Algae and Fungi BIO 4111 Plant-Animal Interactions BIO 4142 Plant Immunity and Symbioses BIO 4144 Plant Molecular Biology BIO 4145 Eukaryotic Microbiology BIO 4158 Applied Biostatistics BPS 3102 Principles of Toxicology and Pharmacology
WINTER	BIO1140 Introduction to Cell and Molecular Biology CHM1321 Organic Chemistry I GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II 3 elective course units	BCH2333 Introduction to Biochemistry BIO2133 Genetics BIO2135 Animal Form and Function 6 elective course units	BIO3142 Plant Developmental Biology 9 optional course units in biology (BIO), biopharmaceutical science (BPS), environmental science (EVS), BCH3120 General Intermediary Metabolism, BCH3125 Protein Structure and Function, BCH3356 Molecular Biology Laboratory, BCH4122 Structural Biology of Proteins, BCH4125 Cellular Regulation and Control, BCH4188 Synthetic Biology, ITI1120 Introduction to Computing I **or** SCI3101 The Public Communication of Science with at least 3 course units at the 3000 or 4000 level 3 elective course units (Fall or Winter)	BIO40092 Honours Research BIO4921 Seminar II Developing and Communicating Science 9 elective course units (Fall or Winter)

Notes Within your program of study, you must complete a minimum of 15 course units at the 3000 level or above with laboratory component. These courses must be selected from the list of optional courses below. BIM4316, BIO3103, BIO3126, BIO3137, BIO3146, BIO3151, BIO3152, BIO3154, BIO3158, BIO3310, BIO3333, BIO3360, BIO3924, BIO4004, BIO4009, BIO4122, BIO4150, BIO4156, BIO4158, BPS4104, BPS4127, BIO1109: This course is beyond the requirements of the programs in science. | At least 9 of the 33 elective course units must be from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management. | Certain courses are offered in alternate years with the French equivalent. | Some 3000-4000 level lecture courses are offered in French and English in alternate years. | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace with electives. | Co-operative education is available with this program. | The French Immersion Stream is available with this program. | The minimum CGPA required to be on good academic standing is 5.0. | Please note that a maximum of 48 units at the 1000 level can be used towards your program.

MAJOR IN BIOLOGY (60 UNITS)

	1ST YEAR (21 units)	2ND YEAR (21 units)	3RD YEAR (9 units)	4TH YEAR (9 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I	BIO2129 Ecology BIO2137 Introduction to Plant Science: Biodiversity to Biotechnology CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics	3 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101	6 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II	BCH2333 Introduction to Biochemistry BIO2133 Genetics BIO2135 Animal Form and Function	6 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101	3 optional course units in BIO, BPS, EVS at the 3000 or 4000 level, BCH3120, BCH3125, BCH3356, BCH4122, BCH4125, BCH4188 or SCI3101

Notes BIO1109: beyond the requirements of the programs in science. | Co-operative education and the French Immersion stream are available when taken as part of an honours degree.

MINOR IN BIOLOGY (30 UNITS)

	1ST YEAR (6 units)	2ND YEAR (6 units)	3RD YEAR (9 units)	4TH YEAR (9 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology	BIO2129 Ecology (Fall) or BIO2133 Genetics (Winter)	3 optional course units in BIO, BPS, EVS at the 3000 or 4000 level (Fall or Winter) 3 optional course units in BIO, BPS, EVS	3 optional course units in BIO, BPS, EVS at the 3000 or 4000 level (Fall or Winter) 3 optional course units in BIO, BPS, EVS
WINTER	BIO1140 Introduction to Cell Biology	BIO2135 Animal Form and Function (Winter) or BIO2137 Introduction to Plant Science: Biodiversity to Biotechnology (Fall)	3 optional course units in BIO, BPS, EVS	3 optional course units in BIO, BPS, EVS

Notes BIO1109: beyond the requirements of the programs in science.

BIOMEDICAL SCIENCE

Biomedical Science is an interdisciplinary program that focuses on the fundamentals of human structure and function, as well as those of other animals. The first two years provide a background in anatomy and physiology in addition to more in-depth knowledge in basic sciences like biology, biochemistry, chemistry and mathematics. After year two, you can choose to combine additional courses in biology and biochemistry with an array of optional courses and obtain a minor in one of many arts or social sciences programs, or you can choose an option in the life sciences, such as neuroscience, cellular and molecular medicine, bioanalytical science, biostatistics and medicinal chemistry.

In addition, the Research Focus is an immersive research experience offered from the third year for students who may be considering a career in research. Upon graduation, students are prepared for more advanced training in research or for admission into one of the professional programs in human health.

SADOR BEREKETAB, RECENT GRADUATE

The biomedical science program at uOttawa is both well-rounded and flexible in nature. In this program, I can take a wide array of courses from various departments including physiology, biopharmaceuticals, physics, on top of the obvious ones. You have the flexibility to make the program what you want it to be. Additionally, thanks to the 10 electives that are offered, I was able to add a music minor to my degree permitting me to diversify my studies. One piece of advice for any student considering this program is to spend your first two years really reflecting on which courses you enjoyed the most. This will help you select courses and research opportunities that truly passion you in your upper years.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Biomedical Science[c, rf]

Options: Bioanalytical Science[c, rf], Biostatistics[c, rf], Cellular and Molecular Medicine[c, rf], Medicinal Chemistry[c, rf], Neuroscience[c, rf]

[c]: There is no direct entry to the Co-operative Education option; you apply in second year.

[rf]: Research Focus available starting in 3rd year

GRADUATE PROGRAMS (MASTERS AND PhD)

Masters and Doctorates in allied disciplines.

CAREER OPPORTUNITIES

Health professional and post-graduate programs (medicine, dentistry, pharmacy, MSc and PhD programs) • scientist in university, government or industry • policy analyst or public health administrator • wide variety of specialty careers in biotech, forensics, pharmaceuticals, etc.

HONOURS BSc IN BIOMEDICAL SCIENCE (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) ANP1111 Essentials of Human Anatomy and Physiology I BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I 3 optional course units from List A	CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics 3 optional course units from List A 3 optional course units from: BPS2110 Introduction to Biopharmaceutical Sciences (Fall) PHY1321 Principles of Physics I (Fall) PHY1322 Principles of Physics II (Winter) 3 optional course units offered by the Faculty of Science, including SCI3101	BIO3124 General Microbiology BIO3170 Molecular Biology BCH3356 Molecular Biology Laboratory (Fall) or BIO3151 Molecular Biology Laboratory (Winter) 3 optional course units at the 3000 or 4000 level offered by the Faculty of Science, including SCI31012 3 elective course units	3 optional course units at the 3000 or 4000 level offered by the Faculty of Science, including SCI31012 9 elective course units 3 optional course units offered by the Faculty of Science, including SCI31012
WINTER	ANP1115 Essentials of Human Anatomy and Physiology II BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II 3 optional course units from List A	BCH2333 Introduction to Biochemistry BIO2133 Genetics 3 optional course units offered by the Faculty of Science, including SCI3101 PHI2396 Bioethics 3 elective course units from List A	BCH3120 General Intermediary Metabolism 9 optional course units at the 3000 or 4000 level offered by the Faculty of Science, including SCI31012 3 elective course units	3 optional course units at the 3000 or 4000 level offered by the Faculty of Science, including SCI31012 12 elective course units

Notes ANP1111 and ANP1115: These courses are compulsory and replace ANP1105 and ANP1106 for students admitted in the 1st year of the Biomedical Science program starting in the fall 2022. | BIO1109: This course is beyond the requirements of the programs in science. | PSY1102: Students who consider the possibility of joining the Neuroscience Option should choose PSY1102 as this course is a prerequisite for 3rd year courses in Psychology – PSY3128 and PSY3171 - that are mandatory for the option. | A student doing an option should choose a course that is not mandatory for their selected option. | PHA4107, PHS3300, PHS3341, PHS3342, PHS4336, CMM3350, CMM4360, MIC4100, MIC4124, MIC4125, MIC4126: these courses are considered science courses. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0. | **List A:** PSY1101 (Fall or Winter); PSY1102 (Fall or Winter) or PSY2114 (Fall or Winter); 3 optional course units in English (ENG) at the 1000 or 2000 level but excluding ENG1112 and ENG1131 (Fall or Winter); 3 elective course units (Fall or Winter). All 4 of these course requirements must be completed. Please select one of each per term for your first four terms.

HONOURS BSc IN BIOMEDICAL SCIENCE - BIOANALYTICAL SCIENCE OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) ANP1111 Essentials of Human Anatomy and Physiology I BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PSY1101 Introduction to Psychology: Foundations (Fall or Winter)	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II MAT2379 Introduction to Biostatistics PHI2396 Bioethics PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	BIO3170 Molecular Biology BCH3356 Molecular Biology Laboratory (Fall) or BIO3151 Molecular Biology Laboratory (Winter) CHM2132 Physical Chemistry for the Life Sciences CHM3120 Intermediate Organic Chemistry CHM3122 Applications of Spectroscopy in Chemistry	BIM4009 Research Project- Biomedical Science (Fall and Winter) or 9 optional course units at the 3000 or 4000 level from the list of optional courses BIM4920 Seminar I 3 optional course units from the list below 6 elective course units
WINTER	ANP1115 Essentials of Human Anatomy and Physiology II BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II 3 optional course units in ENG at the 1000 or 2000 level, excluding ENG1112 and ENG1131	BCH2333 Introduction to Biochemistry BIO2133 Genetics PSY1102 Introduction to Psychology: Applications or PSY2114 Lifespan Psychology (Fall or Winter) 6 elective course units	BCH3120 General Intermediary Metabolism CHM2311 Introduction to Structure and Bonding CHM2354 Analytical Chemistry 3 elective course units 3 optional course units at the 3000 or 4000 level offered by the Faculty of Science, including SCI31012	BIM4009 Research Project- Biomedical Science (Fall and Winter) or 9 optional course units at the 3000 or 4000 level from the list of optional courses BIM4316 Modern Bioanalytical Chemistry BIM4921 Seminar II CHM4354 Principles of Instrumental Analysis PHA4107 Introductory Pharmacology – Drugs and Living Systems

Notes BIO1109: beyond the requirements of the programs in science. | List of optional courses: BCH4123, BCH4172, BIM4103, BIO4158, BPS3350, BPS4102, BPS4103, BPS4127, BPS4129, BPS4131, CHM4139, MAT3377 | PHA4107, PHS3300, PHS3341, PHS3342, PHS4336, MIC4100, MIC4125, MIC4126: these courses are considered science courses. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOMEDICAL SCIENCE - BIOSTATISTICS OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) ANP1111 Essentials of Human Anatomy and Physiology I BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PSY1101 Introduction to Psychology: Foundations (Fall or Winter)	CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics PHI2396 Bioethics PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 elective course units	BIO3170 Molecular Biology BCH3356 Molecular Biology Laboratory (Fall) or BIO3151 Molecular Biology Laboratory (Winter) MAT2371 Introduction to Probability MAT3373 Methods of Machine Learning or MAT3379 Introduction to Time Series Analysis (Winter) PSY1102 Introduction to Psychology: Applications or PSY2114 Lifespan Psychology (Fall or Winter)	BIM4009 Research Project- Biomedical Science (Fall and Winter) or BPS4127 Advanced Techniques in Biosciences and 6 optional course units at the 3000 or 4000 level from the list of optional courses BIM4920 Seminar I BIO4158 Applied Biostatistics (Fall) or MAT4374 Modern Computational Statistics (Winter) MAT3375 Regression Analysis 3 optional course units from the list below
WINTER	ANP1115 Essentials of Human Anatomy and Physiology II BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II 3 optional course units in ENG at the 1000 or 2000 level, excluding ENG1112 and ENG1131	BCH2333 Introduction to Biochemistry BIO2133 Genetics MAT1341 Introduction to Linear Algebra (Fall or Winter) 6 elective course units	BCH3120 General Intermediary Metabolism MAT3378 Analysis of Experimental Designs 3 optional course units at the 3000 or 4000 level offered by the Faculty of Science, including SCI3101 3 elective course units 3 optional course units from the list below	BIM4009 Research Project- Biomedical Science (Fall and Winter) or BPS4127 Advanced Techniques in Biosciences (Fall) and 6 optional course units at the 3000 or 4000 level from the list of optional courses BIM4921 Seminar II 6 optional course units from the list below 3 elective course units

Notes Certain courses are offered in alternating years with the French equivalent. | BIO1109: beyond the requirements of the programs in science. | List of optional courses: BIM4316, BIO3102, BIO3360, BPS3101, BPS4104, BPS4127, CHM2354, MAT4375, MAT4377, MAT4378 | PHA4107, PHS3341, PHS3342, PHS4300 and PHS4336: These courses are considered science courses. | PHA4107, PHS3300, PHS3341, PHS3342, PHS4336, MIC4100, MIC4124, MIC4125, MIC4126: these courses are considered science courses. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOMEDICAL SCIENCE - CELLULAR AND MOLECULAR MEDICINE OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) ANP1111 Essentials of Human Anatomy and Physiology I BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PSY1101 Introduction to Psychology: Foundations (Fall or Winter)	CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics PHI2396 Bioethics PSY1102 Introduction to Psychology: Applications or PSY2114 Lifespan Psychology (Fall or Winter) 3 optional course units from: BPS2110 Introduction to Biopharmaceutical Sciences (Fall) PHY1321 Principles of Physics I (Fall) PHY1322 Principles of Physics II (Winter)	BIO3153 Cell Biology BIO3170 Molecular Biology BCH3356 Molecular Biology Laboratory (Fall) or BIO3151 Molecular Biology Laboratory (Winter) PHS3341 Physiology of Sensation, Regulation, Movement and Reproduction 3 elective course units	BIM4009 Research Project- Biomedical Science (Fall and Winter) or 9 optional course units at the 3000 or 4000 level from the list of optional courses BIM4920 Seminar I BIO3124 General Microbiology 3 optional course units from the list below 3 optional course units from: BIO3360 Computational Tools for Biological Sciences (Winter) BIO4158 Applied Biostatistics (Fall) BPS4104 Bioinformatics Laboratory (Winter) BPS4127 Advanced Techniques in Biosciences (Fall)
WINTER	ANP1115 Essentials of Human Anatomy and Physiology II BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II 3 optional course units in ENG at the 1000 or 2000 level, excluding ENG1112 and ENG1131	BCH2333 Introduction to Biochemistry BIO2133 Genetics 9 elective course units	BCH3120 General Intermediary Metabolism PHS3342 Physiological Regulation of Intake, Distribution, Protection and Elimination 3 elective course units 3 optional course units from the list below 3 optional course units at the 3000 or 4000 level offered by the Faculty of Science , including SCI3101	BIM4009 Research Project- Biomedical Science (Fall and Winter) or 9 optional course units at the 3000 or 4000 level from the list of optional courses BIM4921 Seminar II PHA4107 Introductory Pharmacology–Drugs and Living Systems 6 optional course units from the list below

Notes BIO1109: beyond the requirements of the programs in science. | A student doing an option should choose a course that is not mandatory for their selected option. | PHA4107, PHS3300, PHS3341, PHS3342, PHS4336, CMM3350, CMM4360, MIC4100, MIC4124, MIC4125, MIC4126: these courses are considered science courses. | List of optional courses: BCH3125, BCH/BPS4101, BCH4122, BCH4123, BCH4125, BCH4188, BIM4103, BIM4115, BIM4316, BIM4537, BIO3102, BIO3360, BIO4158, BPS3101, BPS4103, BPS4104, BPS4105, BPS4127, BPS4129, BPS4131, CMM5304, PHS4336 | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOMEDICAL SCIENCE - MEDICINAL CHEMISTRY OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) ANP1111 Essentials of Human Anatomy and Physiology I BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PSY1101 Introduction to Psychology: Foundations (Fall or Winter)	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II MAT2379 Introduction to Biostatistics PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 elective course units	BIO3170 Molecular Biology CHM2132 Physical Chemistry for the Life Sciences CHM3120 Intermediate Organic Chemistry CHM3122 Applications of Spectroscopy in Chemistry BCH3356 Molecular Biology Laboratory (Fall) or BIO3151 Molecular Biology Laboratory (Winter)	BIM4009 Research Project- Biomedical Science (Fall and Winter) or 6 optional course units at the 3000 or 4000 level from the list below and 3 course units from: BIM4316 Modern Bioanalytical Chemistry (Winter) BPS4126 Synthetic and Medicinal Chemistry Laboratory (Winter) BIM4920 Seminar I CHM4123 Medicinal Chemistry 3 optional course units from the list of optional courses at the 3000 or 4000 level 3 elective course units
WINTER	ANP1115 Essentials of Human Anatomy and Physiology II BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II 3 optional course units in ENG at the 1000 or 2000 level, excluding ENG1112 and ENG1131	BCH2333 Introduction to Biochemistry BIO2133 Genetics PHI2396 Bioethics PSY1102 Introduction to Psychology: Applications or PSY2114 Lifespan Psychology (Fall or Winter) 3 elective course units	BCH3120 General Intermediary Metabolism CHM2311 Introduction to Structure and Bonding CHM2354 Analytical Chemistry CHM3126 Laboratory of Organic Chemistry or CHM3127 Laboratory of Organic Chemistry – Research Option PHI2396 Bioethics 6 elective course units	BIM4009 Research Project- Biomedical Science (Fall and Winter) or 6 optional course units at the 3000 or 4000 level from the list below and 3 course units from: BIM4316 Modern Bioanalytical Chemistry BPS4126 Synthetic and Medicinal Chemistry Laboratory BIM4921 Seminar II PHA4107 Introductory Pharmacology – Drugs and Living Systems 3 optional course units at the 3000 or 4000 level offered by the Faculty of Science, including SCI3101 3 elective course units

Notes BIO1109: is beyond the requirements of the programs in science. | List of optional courses: BCH4123, BIM4103, BIM4316, BPS3350, BPS4103, BPS4105, BPS4121, BPS4126, BPS4129, BPS4131, CHM4139, CHM4141, CHM4317, CHM4319, CHM4354 | PHS3300, PHS3341, PHS3342, PHS4336, MIC4100 MIC4125, MIC4126: The following courses are considered science courses. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Science or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA to be in good academic standing is 5.0.

HONOURS BSc IN BIOMEDICAL SCIENCE - NEUROSCIENCE OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) ANP1111 Essentials of Human Anatomy and Physiology I BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PSY1101 Introduction to Psychology: Foundations (Fall or Winter)	CHM2120 Organic Chemistry II MAT2379 Introduction to Biostatistics PHI2396 Bioethics PSY1102 Introduction to Psychology: Applications or PSY2114 Lifespan Psychology (Fall or Winter) 3 elective course units	BIO3153 Cell Biology BIO3170 Molecular Biology BIO3305 Cellular Physiology BCH3356 Molecular Biology Laboratory (Fall) or BIO3151 Molecular Biology Laboratory (Winter) 3 elective course units	BIM4920 Seminar I BIO3124 General Microbiology BIM4009 (Fall and Winter) or 6 optional course units at the 3000 or 4000 level from the list of optional courses below and 3 optional course units from: BIO3360 (Winter) BIM4316 (Winter) BPS4127 6 elective course units
WINTER	ANP1115 Essentials of Human Anatomy and Physiology II BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II 3 optional course units in ENG at the 1000 or 2000 level, excluding ENG1112 and ENG1131	BCH2333 Introduction to Biochemistry BIO2133 Genetics BIO3303 Animal Physiology I PHY1322 Principles of Physics II 3 elective course units	BCH3120 General Intermediary Metabolism BIO3350 Principles of Neurobiology PHA4107 Introductory Pharmacology - Drugs and Living Systems 3 optional course units in psychology (PSY) from: PSY3128 The Psychology of Ageing PSY3171 Psychopathology 3 optional course units at the 3000 or 4000-level offered by the Faculty of Science, including SCI3101	BIO4175 Membrane Physiology BIO4351 Neural Basis of Animal Behaviour BIM4921 Seminar II BIM4009 (Fall and Winter) or 6 optional course units at the 3000 or 4000 level from the list of optional courses below and 3 optional course units from: BIO3360 BIM4316 BPS4127 (Fall) 3 optional course units from the list of optional courses below

Notes PSY1102: Students who consider the possibility of joining the Neuroscience Option should choose PSY1102 as this course is a prerequisite for 3rd year courses in Psychology – PSY3128 and PSY3171 - that are mandatory for the option. | BIO1109: beyond the requirements of the programs in science. | PHA4107, PHS3300, PHS3341, PHS3342, PHS4336, CMM3350, CMM4360: these courses are considered science courses. | List of optional courses: ANP1107, BCH3125, BCH4101 or BPS4101, BCH4122, BCH4125, BCH4188, BIM4103, BIM4316, BIM4350, BIO2135, BIO3137, BIO3147, BIO3152, BIO3360, BIO4158, BPS3101, BPS4103, BPS4105, BPS4127, BPS4131, CMM4360, PHS3341, PHS3342 | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Science or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

BIOPHARMACEUTICAL SCIENCE

This interdisciplinary program, offered through the Department of Chemistry and Biomolecular Sciences, combines basic studies from areas such as molecular biology, biochemistry, pharmacology and organic chemistry and adds new courses designed especially for biopharmaceutical science (BPS) students.

The goal is to prepare students who, with further specialization, will be ready to work in an interdisciplinary environment at the interfaces between biology, chemistry and health-related sciences.

Students must choose between two options: genomics (for students interested in the genetic and biological aspects of the field) and medicinal chemistry (for those fascinated by organic and biological chemistry). Genomics focuses on molecular biology and the function of genes and proteins in the study of diseases. Medicinal chemistry emphasizes organic and biological chemistry and their application to the production of new and better pharmaceuticals.

Students make their final choice of study stream at the end of their second year. To help students make an informed choice, the first two years of the program are identical for both options. Students can then decide, after experiencing material from each option, what is the best choice for them. A special course, Introduction to Biopharmaceutical Science, is available after first year to expose students to some advanced material from both pathways.

Both streams enable graduates to enter any area of the growing health sector, from biomedical research and biopharmaceuticals development to drug manufacturing and regulation. They also meet all the requirements for entry into professional programs such as medicine, law, education and administration.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Biopharmaceutical Science[c]

Options: Genomics[c], Medicinal Chemistry[c]

[c]: Cooperative education is offered as part of four-year honours bachelor degrees.

GRADUATE PROGRAMS (MASTERS AND PhD)

Master and Doctorate in allied disciplines.

CAREER OPPORTUNITIES

Pharmaceutical bacteriologist • pharmacological chemist • bioinformatician • toxicologist • pharmaceutical sales representative • bioanalytical chemist

HONOURS BSc IN BIOPHARMACEUTICAL SCIENCE - GENOMICS OPTION (120 UNITS)

	1ST YEAR* (30 units)	2ND YEAR* (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 course units in ENG at the 1000 or 2000 level	BPS2110 Introduction to Biopharmaceutical Sciences CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2132 Physical Chemistry for the Life Sciences MAT2379 Introduction to Biostatistics	BIO3119 Population Genetics BIO3170 Molecular Biology BPS3101 Genomics BCH3356 Molecular Biology Laboratory (Fall) or BIO3151 Molecular Biology Laboratory (Winter) 3 optional course units from the Genomics list below	BPS4900 Seminar (Fall and Winter) BPS4006 Honours Project (Fall and Winter) or BPS4127 Advanced Techniques in Biosciences (Fall) with 6 optional course units at the 3000 or 4000 level from the Genomics list BPS4101 Human Genome Structure and Function (Fall) BPS4104 Bioinformatics Laboratory (Winter) PHA4107 Introductory Pharmacology — Drugs and Living Systems (Winter) 3 optional course units at the 3000 or 4000 level offered by the Faculty of Science (Fall or Winter) 3 elective course (Fall or Winter) 3 optional course units from the Genomics list below
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II PHY1322 Principles of Physics II or GEO1111 Introduction to Earth Systems 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH2333 Introduction to Biochemistry BIO2133 Genetics PHI2396 Bioethics 3 elective course units 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH3120 General Intermediary Metabolism BIO2135 Animal Form and Function BIO3102 Molecular Evolution ITI1120 Introduction to Computing I (Fall or Winter) 3 optional course units from the Genomics list below	

Notes For students intending to pursue graduate studies in Chemistry, it is highly recommended to take 6 course units in CHM from the optional courses list in Medicinal Chemistry. | BPS4006 is highly recommended. | *The courses in the first two years are the same for both program options (Genomics and Medicinal Chemistry). | BIO1109: beyond the requirements of the programs in science. | List of optional courses in Genomics: BCH3125, BCH3346, BCH4122, BCH4125, BCH4172, BCH4188, BIM4103, BIM4316, BIO2137, BIO3124, BIO3126, BIO3140, BIO3147, BIO3152, BIO3153, BIO3302, BIO3303, BIO3305, BIO4109, BIO4115, BIO4127, BIO4144, BIO4145, BPS3102, BPS4102, BPS4103, BPS4105, BPS4111, BPS4123, BPS4129, BPS4131, MIC4100, MIC4124, MIC4125, MIC4126, PHS3341, PHS3342 | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN BIOPHARMACEUTICAL SCIENCE - MEDICINAL CHEMISTRY OPTION (120 UNITS)

	1ST YEAR* (30 units)	2ND YEAR* (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 course units in ENG at the 1000 or 2000 level	BPS2110 Introduction to Biopharmaceutical Sciences CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2132 Physical Chemistry for the Life Sciences MAT2379 Introduction to Biostatistics	BIO3170 Molecular Biology BCH3356 Molecular Biology Laboratory (Fall) or BIO3151 Molecular Biology Laboratory (Winter) CHM3120 Intermediate Organic Chemistry CHM3122 Applications of Spectroscopy in Chemistry CHM3126 Laboratory of Organic Chemistry (Fall or Winter)	BPS4900 Seminar (Fall and Winter) BPS4006 Honours Project (Fall and Winter) or BPS4126 Synthetic and Medicinal Chemistry Laboratory (Winter) with 6 optional course units from the Medicinal Chemistry list below CHM4354 Principles of Instrumental Analysis (Winter) or BIM4316 Modern Bioanalytical Chemistry (Winter) BPS4125 Medicinal Chemistry (Fall) PHA4107 Introductory Pharmacology — Drugs and Living Systems (Winter) 3 optional course units at the 3000 or 4000 level offered by the Faculty of Science 6 optional course units from the Medicinal Chemistry list below (Fall or Winter)
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II PHY1322 Principles of Physics II or GEO1111 Introduction to Earth Systems 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH2333 Introduction to Biochemistry BIO2133 Genetics PHI2396 Bioethics 3 elective course units 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BCH3120 General Intermediary Metabolism CHM2311 Introduction to Structure and Bonding CHM2354 Analytical Chemistry 3 optional course units from the Medicinal Chemistry list below 3 elective course units	

Notes For students intending to pursue graduate studies in Chemistry, it is highly recommended to take 6 course units in CHM from the optional courses list in Medicinal Chemistry. | BPS4006 is highly recommended. | *The courses in the first two years are the same for both program options (Genomics and Medicinal Chemistry). | BIO1109: beyond the requirements of the programs in science. | List of optional courses in Medicinal Chemistry: BCH3125, BIM4316, BPS3350, BPS4103, BPS4111, BPS4121, BPS4126, BPS4129, BPS4131, CHM3350, CHM4120, CHM4139, CHM4141, CHM4155, CHM4317, CHM4319, CHM4325, CHM4328, CHM4354 | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

DID YOU KNOW?

You can follow your bachelor degree with a one-year masters in the **Pathway 4+1** program in Chemistry! This program allows you to graduate with the fundamental BSc training plus additional skills from the masters, which enables a smoother integration into the workforce - notably in the high tech industry or the research world. You will be exposed to advanced topics and professors that are world-leading researchers. If you are looking for further training for a stimulating career in academic research or industry, find out more by contacting gradsci@uOttawa.ca.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Chemistry[c]

Options: Advanced Materials[c], Ecochemistry[c]

Major in Chemistry[c]

Minor in Chemistry[cp]

[c]: Cooperative education is offered as part of four-year honours bachelor degrees.

[cp]: Complementary program offered only as a second discipline. Registration starts in second year.

GRADUATE PROGRAMS (MASTERS AND PhD)

Master of Science (MSc)

Doctorate (PhD)

CAREER OPPORTUNITIES

Medical isotope preparation technician • pharmaceutical chemist • materials chemist • instrument technician (such as mass spectrometrist) • material and chemical reaction modeller • environmental analytical chemist or consultant • police and border services forensic chemist • safety evaluator for food pesticides and additives • patent law • researcher

CHEMISTRY

Chemistry (CHM) is a modern, dynamic and diverse field that involves investigating the substances that makes up our physical world and how these substances change. Chemistry touches everything we come into contact with. As a result, it is a field with connections to almost all other areas of science and engineering. For example, chemists play a vital role in developing new drugs and materials for advanced electronic devices. Chemists are also important players in such diverse areas as genetic engineering, forensic science as well as the oil and gas industry. More recently, chemists have been at the forefront of the nanotechnology field and emerging green technologies, particularly in the development of sustainable energy sources.

The Department of Chemistry and Biomolecular Sciences offers modern programs that provide advanced training in the traditional areas of chemistry, such as organic, inorganic, physical, computational and analytical chemistry. The Department also has specialized options in Advanced Materials and in Ecochemistry, unique to uOttawa. In addition to innovative and interactive classroom teaching, the program contains a substantial practical laboratory training component. The lab component allows for a focus on individual instruction as well as research lab-style collaborative work using data acquisition tools.

KAITLIN THOMPSON, 3RD YEAR

Though the chemistry program at uOttawa can be challenging due to the heavy course workload, with decent time management skills, it's an amazing learning experience. This program opens so many doors that your future job doesn't even have to be chemistry related! Over the course of four years, you get to learn a variety of chemistry (CHM) courses such as physical, organic, inorganic, analytical and biochemistry. If a certain branch of chemistry piques your interest, your optional CHM course credits can be satisfied by taking the chemistry courses of your liking. Also, our chemistry professors do some awesome research and by contacting them, you might get a chance to work for them in the summer and get a taste of what your future might possibly look like. In my case, in the summer after my second year, I got to learn and work on lanthanide-doped upconversion nanoparticles and meet people from around the world who were also researching this!

HONOURS BSc IN CHEMISTRY (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)	
FALL	CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1320 Calculus I MAT1341 Introduction to Linear Algebra PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2131 Chemical Thermodynamics of Gases and Solutions CHM2353 Descriptive Inorganic Chemistry 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	CHM3120 Intermediate Organic Chemistry CHM3122 Applications of Spectroscopy in Chemistry CHM3126 Laboratory of Organic Chemistry or CHM3127 Laboratory of Organic Chemistry – Research Option CHM3140 Quantum Chemistry and Molecular Modelling CHM3350 Transition Metal Chemistry	CHM40101 Research Project and Seminar 3 course units from: **Physical – Theoretical** (Fall or Winter) CHM4141 Computational Chemistry I CHM4143 Computational Chemistry II CHM4182 Molecular Dynamics in Chemistry CHM4340 Applications of Theoretical Chemistry CHM4380 Advanced Characterization Methods in Material Science and Catalysis CHM4381 Photochemistry and Photobiology CHM4390 Special Topics in Physical Chemistry CHM4391 Selected Topics in Physical Chemistry 3 course units from: **Organic – Bio-organic** (Fall or Winter)	BIM4316 Modern Bioanalytical Chemistry BPS4129 Advanced Chemical Biology CHM4120 Advanced Organic Chemistry CHM4123 Medicinal Chemistry CHM4139 Enzyme Chemistry and Biocatalysis CHM4155 Polymer and Applied Chemistry CHM4325 Advanced Organic Synthesis and Reaction Mechanisms CHM4328 Special Topics in Organic Chemistry 3 course units from: **Inorganic – Materials** (Fall or Winter) CHM4129 Chemistry of Sustainable Energy CHM4311 Selected Topics in Inorganic Chemistry CHM4313 Solid State Chemistry CHM4317 Organometallic Chemistry CHM4318 Nanostructured Materials CHM4319 Bio-Inorganic Chemistry
WINTER	CHM1321 Organic Chemistry I MAT1322 Calculus II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed) 6 elective course units	BCH2333 Introduction to Biochemistry CHM2330 Physical Chemistry: Introduction to the Molecular Properties of Matter CHM2354 Analytical Chemistry PHY2100 Fundamentals of Applied Physics III 3 optional course units in CHM at the 2000, 3000 or 4000 level	CHM3373 Molecular Spectroscopy and Statistical Mechanics 3 optional course units in CHM at the 3000 or 4000 level 6 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 elective course units	CHM40102 Research Project and Seminar CHM4354 Principles of Instrumental Analysis (Fall or Winter) 9 elective course units	

Notes Students in the cooperative education option must replace CHM4010 with: CHM4016 Research project (6 course units) plus 3 course units in CHM at the 3000 or 4000 level. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN CHEMISTRY - ADVANCED MATERIALS OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1320 Calculus I PHY1121 Fundamentals of Physics I or PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 elective course credits	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2131 Chemical Thermodynamics of Gases and Solutions CHM2353 Descriptive Inorganic Chemistry 3 elective course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management	CHM3120 Intermediate Organic Chemistry CHM3122 Applications of Spectroscopy in Chemistry CHM3140 Quantum Chemistry and Molecular Modelling CHM3350 Transition Metal Chemistry 3 elective course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management	CHM40101 Research Project CHM4380 Advanced Characterization Methods in Material Science and Catalysis 3 optional course units from the list below 3 optional course units of chemistry (CHM) at the 3000 or 4000 level from the list below 3 elective course credits
WINTER	CHM1321 Organic Chemistry I MAT1322 Calculus II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II 3 elective course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management 3 elective course credits	CHM2128 Synthesis and Characterization of Advanced Materials CHM2330 Physical Chemistry: Introduction to the Molecular Properties of Matter CHM2354 Analytical Chemistry 6 elective course credits	CHM3373 Molecular Spectroscopy and Statistical Mechanics 3 optional course units of chemistry (CHM) at the 3000 or 4000 level from the list below 3 optional course units from the list below 3 elective course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management 3 elective course credits	CHM40102 Research Project CHM4118 Advanced Materials Laboratory CHM4318 Nanostructured Materials CHM4354 Principles of Instrumental Analysis

Notes CHM4010: A project related to Advanced Materials is strongly recommended. | Students in the cooperative education option only should replace CHM4010 with: CHM4016 - Travail de recherche / Research project (6 units) ; Plus 3 course units in chemistry (CHM) at the 3000 or 4000 level. | Although the program is well suited for future graduate work, for students intending to pursue graduate studies in Chemistry, it is highly recommended to take six of their elective units from the list of chemistry (CHM) courses in their area of interest at the 4000 level. | List of optional courses: BCH2333, CHM3126, CHM4123, CHM4141, CHM4143, CHM4155, CHM4182, CHM4311, CHM4313, CHM4317, CHM4325, CHM4340, CHM4381, GEO2163, GEO3167, MAT1341, PHY2100 or PHY2323, PHY2361, PHY3350, PHY4382, PHY4387 | Co-operative education is available with this program. | The French Immersion stream is available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN CHEMISTRY - ECOCHEMISTRY OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1320 Calculus I or MAT1330 Calculus for the Life Sciences I PHY1121 Fundamentals of Physics I or PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	BIO2129 Ecology CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2131 Chemical Thermodynamics of Gases and Solutions CHM2353 Descriptive Inorganic Chemistry	CHM3120 Intermediate Organic Chemistry CHM3122 Applications of Spectroscopy in Chemistry CHM3350 Transition Metal Chemistry 3 optional course units of chemistry (CHM) at the 2000, 3000 or 4000 level 3 elective course units offered by the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management. Some of them may come from those listed below.	CHM4010 Research Project 3 optional course units of chemistry (CHM) at the 3000 or 4000 level from the list below 3 elective course units offered by the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management. Some of them may come from those listed below. 3 elective course units
WINTER	CHM1321 Organic Chemistry I MAT1322 Calculus II or MAT1332 Calculus for the Life Sciences II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II 3 elective course units offered by the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management. Some of them may come from those listed below. 3 elective course units	CHM2313 Environmental Chemistry CHM2330 Physical Chemistry: Introduction to the Molecular Properties of Matter CHM2354 Analytical Chemistry 6 elective course units	3 optional course units of chemistry (CHM) at the 3000 or 4000 level from the list below CHM3128 Catalysis and Sustainable Chemical Manufacturing 3 optional course units from the list below 3 elective course units offered by the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management. Some of them may come from those listed below. 3 elective course units	CHM4010 Research Project CHM4129 Chemistry of Sustainable Energy CHM4354 Principles of Instrumental Analysis 3 optional course units from the list below 3 elective course units

Notes BIO1109: This course is beyond the requirements of the programs in science. | CHM4010: Project related to ecochemistry is strongly recommended. | Students in the cooperative education option only should replace CHM4010 with: CHM4016 - Travail de recherche / Research project (6 units) ; Plus 3 course units in chemistry (CHM) at the 3000 or 4000 level. | Although the program is well suited for future graduate work, for students intending to pursue graduate studies in Chemistry, it is highly recommended to take six of their elective units from the list of chemistry (CHM) courses in their area of interest at the 4000 level. | List of optional courses: BCH2333, BIO1140, BIO3117, BIO4146, BPS4121, BPS4123, CHM3140, CHM3373, CHM4123, CHM4139, CHM4155, CHM4182, CHM4311, CHM4317, CHM4325, CHM4380, CHM4381, CVG2132, DVM2105, DVM3125, ECO2121, ENV1101, ENV3101, EVS1101, GEG1301, GEG3302, GEG/ENV4118, GEO1111, GEO2163, GEO2166, GEO2307, GEO2334, GEO3167, GEO3342, GEO3382, HIS2129, MAT2379, POL1102, SOC4310 | Co-operative education is available with this program. | The French Immersion stream is available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

MAJOR IN CHEMISTRY (60 UNITS)

	1ST YEAR (18 units)	2ND YEAR (24 units)	3RD YEAR (12 units)	4TH YEAR (6 units)
FALL	CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1320 Calculus I PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II CHM2131 Chemical Thermodynamics of Gases and Solutions CHM2353 Descriptive Inorganic Chemistry	6 optional course units in CHM at the 3000 or 4000 level	3 optional course units in CHM at the 4000 level
WINTER	CHM1321 Organic Chemistry I MAT1322 Calculus II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed)	BCH2333 Introduction to Biochemistry CHM2330 Physical Chemistry: Introduction to the Molecular Properties of Matter CHM2354 Analytical Chemistry 3 optional course units in CHM at the 2000, 3000 or 4000 level	6 optional course units in CHM at the 3000 or 4000 level	3 optional course units in CHM at the 4000 level

Notes Co-operative education and the French Immersion stream are available when taken as part of an honours degree. | Please note that all programs in the: Faculty of Science require a minimum of 12 course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management.

MINOR IN CHEMISTRY (30 UNITS)

	1ST YEAR (6 units)	2ND YEAR (6 units)	3RD YEAR (9 units)	4TH YEAR (9 units)
FALL	CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed)	3 optional course units in CHM	3 optional course units in CHM at the 3000 or 4000 level 3 optional course units in CHM	3 optional course units in CHM
WINTER	CHM1321 Organic Chemistry I	3 optional course units in CHM	3 optional course units in CHM at the 3000 or 4000 level	6 optional course units in CHM

ENVIRONMENTAL SCIENCE

Environmental science (EVS) is the interdisciplinary study of the environment, its functioning and its relationship to human activities. Society has a growing need for specialists able to recognize, understand, solve and prevent environmental problems.

The environmental science program, offered through the Department of Earth and Environmental Sciences, focuses on the integration of traditional science disciplines (e.g. biology, earth sciences, chemistry, physics) to study the natural environment and the impact of human activities. The program consists of a core of basic science courses complemented by courses in various disciplines that address the scientific and societal aspects of environmental problems. Within this program, you must select among three areas of specialization: conservation and biodiversity; global change; and environmental geochemistry and ecotoxicology. The final year entails an independent research project or equivalent units in advanced courses in the student's specialization.

The EVS program is accredited by ECO Canada, the national organization whose mission is to promote the competence and the excellence of academic programs, the environmental careers, and recognition of the professional expertise of environment workers. "ECO Canada provides resources to help individuals learn about, train for, and find environmental careers." This additional asset to the EVS program will help you plan an exciting career after your graduation.

VICTORIA FLATT, 3RD YEAR

My journey here has been incredibly enriching and enlightening. This experience has expanded my perspective, unveiling limitless possibilities while allowing me to discover a passion for understanding and researching our environment. Through connecting with professors, I've been introduced to numerous distinctive opportunities and discovered pathways for personal growth. I have been able to delve into radiocarbon dating through a lab position as well as research in the Appalachian Mountains through a field course, both of which have equipped me with practical skills that significantly contribute to my academic and personal development. I wholeheartedly advocate for embracing every opportunity that comes your way, as it may pave the way for invaluable experiences and opportunities.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Environmental Science[c]

Options: Conservation and Biodiversity[c], Environmental Geochemistry and Ecotoxicology[c], Global Change[c]

[c]: Cooperative education is offered as part of four-year honours bachelor degrees.

GRADUATE PROGRAMS (MASTERS AND PhD)

Master and Doctorate in allied disciplines.

CAREER OPPORTUNITIES

Environmental consultant or impact analyst • environmental program development supervisor • researcher • natural resource planner or policy analyst • conservation biologist • water quality specialist

HONOURS BSc IN ENVIRONMENTAL SCIENCE - CONSERVATION AND BIODIVERSITY OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (33 units)	3RD YEAR (27 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	BIO2129 Ecology BIO2137 Introduction to Plant Science: Biodiversity to Biotechnology CHM2353 Descriptive Inorganic Chemistry GEO2113 Palaeontology (Winter) or GEO2316 or GEO2334 Quaternary Geology and Climate Change (Fall) (to be taken in 2nd or 3rd year) MAT2379 Introduction to Biostatistics	EVS3101 Environmental Issues EVS3120 Environmental Microbiology BIO4158 Applied Biostatistics (Fall) or GEO4306 Applied GIS for Science and Engineering (to be taken in 3rd or 4th year) 3 optional course units at the 2000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below)	EVS4904 Seminar (Fall or Winter) EVS4009 Research Project (Fall and Winter) or 9 optional course units at the 3000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below) 3 optional course units at the 2000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below) 3 optional course units offered by the Faculty of Science or the Faculty of Engineering
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I EVS1101 Introduction to Environmental Science GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II	BIO2135 Animal Form and Function GEG1302 Places and Spaces of Human Activity GEG2320 Introduction to Geomatics (Fall or Winter) 3 optional course units at the 2000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below) 3 elective course units offered by the Faculty of Arts, the Faculty of Education, the Faculty of Law, the Faculty of Social Sciences or the Telfer School of Management	BIO3115 Conservation Biology BIO3117 Ecosystem Ecology ENV3321 Human and Policy Dimensions of Environmental Change EVS3102 The Practice of Environmental Science GEO3342 Introduction to Hydrogeology (to be taken in 3rd or 4th year)	3 optional course units offered by the Faculty of Science or the Faculty of Engineering 9 elective course units offered by the Faculty of Arts, the Faculty of Education, the Faculty of Law, the Faculty of Social Sciences or the Telfer School of Management
SUMMER		EVS4010 - Field Course in Environmental Science Prerequisites: BIO2129, MAT2379 and the completion of a minimum of 60 units in the Environmental Science Program (offered during the last 2 weeks of August). This course is to be added to the following fall term).		

Notes GEO2113, GEO2334, GEO3342, GEO3352: These courses are offered in alternate years with the French equivalent. | BIO1109: This course is beyond the requirements of the programs in science. | Optional courses offered by the faculties of Science, Engineering, or the Department of Geography (GEG): BCH2333, BIO3103, BIO3124, BIO3126, BIO3154, BIO3158, BIO3176, BIO3333, BPS3102, CHG4381, CHM2120, CHM2123, CHM3120, CHM3126, CHM4155, CHM4354, CVG2132, DVM2105, DVM3125, DVM3135, GEG3106, GEG3303, GEG3306, GEG3312, GEG4104, GEG4118, GEG4120, GEG4121, GEO2166, GEO3382, GEO4309, GEO4314, GEO4315, GEO4341, GEO4342, GEO4354, GEO4382, MAT3377, SCI3101 | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0. | Please note that a maximum of 48 units at the 1000 level can be used towards your program.

HONOURS BSc IN ENVIRONMENTAL SCIENCE - ENVIRONMENTAL GEOCHEMISTRY AND ECOTOXICOLOGY OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (33 units)	3RD YEAR (27 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	BIO2129 Ecology CHM2353 Descriptive Inorganic Chemistry MAT2379 Introduction to Biostatistics 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 optional course units at the 2000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below)	BIO4158 Applied Biostatistics (Fall) or GEO4306 Applied GIS for Science and Engineering EVS3101 Environmental Issues EVS3120 Environmental Microbiology GEO2163 Introduction to Mineralogy	BIO4156 Freshwater Ecology (to be taken in 3rd or 4th year) EVS4904 Seminar (Fall or Winter) EVS4009 Research Project (Fall and Winter) or 9 optional course units at the 3000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below) 3 optional course units from the faculties of Science or Engineering
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I EVS1101 Introduction to Environmental Science GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II	CHM2313 Environmental Chemistry (to be taken in 2nd or 3rd year) CHM2354 Analytical Chemistry GEG1302 Places and Spaces of Human Activity GEG2320 Introduction to Geomatics (Fall or Winter) 3 elective course units offered by the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BIO2110 Environmental Physiology (to be taken in 2nd or 3rd year) BIO3117 Ecosystem Ecology BIO4146 Ecotoxicology (to be taken in 3rd or 4th year) EVS3102 The Practice of Environmental Science GEO3342 Introduction to Hydrogeology (to be taken in 3rd or 4th year)	3 optional course units at the 2000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below) 3 optional course units from the faculties of Science or Engineering 6 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management
SUMMER		EVS4010 - Field Course in Environmental Science Prerequisites: BIO2129, MAT2379 and the completion of a minimum of 60 units in the Environme¢ntal Science Program (offered during the last 2 weeks of August). This course is to be added to the following fall term).		

Notes BIO2110, BIO4146, BIO4156, CHM2313, GEO3342, GEO3352: These courses are offered in alternate years with the French equivalent. | BIO1109: This course is beyond the requirements of the programs in science. | Optional courses offered by the Faculty of Science, the Faculty of Engineering, or the Department of Geography (GEG): BCH2333, BIO3103, BIO3124, BIO3126, BIO3154, BIO3158, BIO3176, BIO3333, BPS3102, CHG4381, CHM2120, CHM2123, CHM3120, CHM3126, CHM4155, CHM4354, CVG2132, DVM2105, DVM3125, DVM3135, GEG3106, GEG3303, GEG3306, GEG3312, GEG4104, GEG4118, GEG4120, GEG4121, GEO2166, GEO3382, GEO4309, GEO4314, GEO4315, GEO4341, GEO4342, GEO4354, GEO4382, MAT3377, SCI3101, GEO2316 | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0. | Please note that a maximum of 48 units at the 1000 level can be used towards your program.

HONOURS BSc IN ENVIRONMENTAL SCIENCE - GLOBAL CHANGE OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	BIO2129 Ecology CHM2353 Descriptive Inorganic Chemistry MAT2379 Introduction to Biostatistics 6 optional course units from GEG2304 (to be taken in 2nd or 3rd year) or GEO2316 or GEO2334 (to be taken in 2nd or 3rd year)	EVS3101 Environmental Issues EVS3120 Environmental Microbiology BIO4158 Applied Biostatistics (Fall) or GEO4306 Applied GIS for Science and Engineering 6 course units from: BIO4150 Spatial Ecology ENV3321 Human and Policy Dimensions of Environmental Change GEG3102 Hydrology GEG3105 Remote Sensing GEG3107 Geography of Polar Regions GEG3114 Biogeography GEG3302 Natural Resource Management GEG3312 Advanced GIS GEG4100 Glaciology GEG4101 Permafrost Environments GEG4112 Quaternary Paleoenvironments GEG4118 Environmental Impact Assessment GEG4129 Global Climate Change	EVS4904 Seminar (Fall or Winter) EVS4009 Research Project (Fall and Winter) or 9 optional course units at the 3000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below) 3 course units from: BIO4150 Spatial Ecology ENV3321 Human and Policy Dimensions of Environmental Change GEG3102 Hydrology GEG3105 Remote Sensing GEG3107 Geography of Polar Regions GEG3114 Biogeography GEG3302 Natural Resource Management GEG3312 Advanced GIS GEG4100 Glaciology GEG4101 Permafrost Environments GEG4112 Quaternary Paleoenvironments GEG4118 Environmental Impact Assessment GEG4129 Global Climate Change 3 optional course units offered by the Faculty of Science or the Faculty of Engineering
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I EVS1101 Introduction to Environmental Science GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II	GEG1302 Places and Spaces of Human Activity GEG2320 Introduction to Geomatics (Fall or Winter) 6 optional course units at the 2000 level or above from the list of optional courses offered by the faculties of Science, Engineering, the Department of Geography (GEG) or from one of the options in EVS (see list below) 3 elective course units offered by the Faculty of Arts, the Faculty of Education, the Faculty of Law, the Faculty of Social Sciences or the Telfer School of Management	BIO3117 Ecosystem Ecology EVS3102 The Practice of Environmental Science GEO3342 Introduction to Hydrogeology (to be taken in 3rd or 4th year) 3 course units from: BIO4150 Spatial Ecology ENV3321 Human and Policy Dimensions of Environmental Change GEG3102 Hydrology GEG3105 Remote Sensing GEG3107 Geography of Polar Regions GEG3114 Biogeography GEG3302 Natural Resource Management GEG3312 Advanced GIS GEG4100 Glaciology GEG4101 Permafrost Environments GEG4112 Quaternary Paleoenvironments GEG4118 Environmental Impact Assessment GEG4129 Global Climate Change	3 optional course units offered by the Faculty of Science or the Faculty of Engineering 9 elective course units offered by the Faculty of Arts, the Faculty of Education, the Faculty of Law, the Faculty of Social Sciences or the Telfer School of Management
SUMMER		EVS4010 - Field Course in Environmental Science Prerequisites: BIO2129, MAT2379 and the completion of a minimum of 60 units in the Environmental Science Program (offered during the last 2 weeks of August). This course is to be added to the following fall term.		

Notes Most of the mandatory 2000-, 3000- and 4000-level courses are offered in French and English in alternate years (see schedule). | BIO1109: beyond the requirements of the programs in science. | Optional courses offered by the Faculty of Science, the Faculty of Engineering, or the Department of Geography (GEG): BCH2333, BIO3103, BIO3124, BIO3126, BIO3154, BIO3158, BIO3176, BIO3333, BPS3102, CHG4381, CHM2120, CHM2123, CHM3120, CHM3126, CHM4155, CHM4354, CVG2132, DVM2105, DVM3125, DVM3135, GEG3106, GEG3303, GEG3306, GEG3312, GEG4104, GEG4118, GEG4120, GEG4121, GEO2166, GEO3382, GEO4309, GEO4314, GEO4315, GEO4341, GEO4342, GEO4354, GEO4382, MAT3377, SCI3101 | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0. | Please note that a maximum of 48 units at the 1000 level can be used towards your program.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Geology[c]

Honours BSc in Environmental Geoscience[c]

Honours BSc in Geology- Physics[c]

Major in Geology[c]

Minor in Geology[cp]

[c]: Cooperative education is offered as part of four-year honours bachelor degrees.

[cp]: Complementary program offered only as a second discipline. Registration starts in second year.

GRADUATE PROGRAMS (MASTERS AND PhD)

Master of Science (MSc)

Doctorate (PhD)

CAREER OPPORTUNITIES

Environmental geoscientist • groundwater hydrogeologist • geophysicist • geochemist • volcanologist • petroleum geologist • mining and mineral exploration geologist

ENVIRONMENTAL GEOSCIENCE, GEOLOGY, GEOLOGY-PHYSICS

The Department of Earth and Environmental Sciences offers degree programs in environmental geoscience, geology and geology-physics. Research strengths at the department include environmental geosciences, sedimentary systems, natural resources, earth materials and geodynamics.

Geology involves the study of the composition, structure and evolution of the Earth and other planetary bodies. The discipline builds from a basic understanding of physics, chemistry, and often biology, and extends into many specialties like mineralogy and material sciences, the evolution of life and paleontology, environmental geology, economic geology, geochemistry, and geophysics.

As a result, geologists study natural materials and geological processes across a range of spatial and temporal scales—from isotopes and crystals to mountain ranges and planetary dynamics. Geologists spend their time in both the field and a laboratory setting applying scientific methods to unravel the Earth's puzzles. Training to be a geologist involves developing analytical and critical thinking skills.

Enrolling in the BSc Honours with any of the three specializations will allow students to meet the accreditation requirements of professional bodies and practise as geoscientists. In their first year, students increase their knowledge of mathematics, physics, chemistry and biology. Later in the program, students focus on the geology aspect of the program, which consists of lecture-laboratory courses and abundant opportunities for field excursions. The final year involves an independent research project or equivalent units in advanced courses in the discipline.

HONOURS BSc IN ENVIRONMENTAL GEOSCIENCE (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry (or CHM1301 if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1330 Calculus for the Life Sciences I PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	BIO2129 Ecology CHM2353 Descriptive Inorganic Chemistry (Fall) or CHM2330 Physical Chemistry: Introduction to the Molecular Properties of Matter (Winter) GEO2163 Introduction to Mineralogy GEO2165 Stratigraphy and Sedimentation GEO2334 Quaternary Geology and Climate Change	EVS3120 Environmental Microbiology GEO3163 Igneous Petrology GEO3191 Applied Geophysics 3 elective course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended) 3 elective course units	GEO4010 Honours Project (Fall and Winter) or 6 optional course units in geology (GEO) at the 3000 or 4000 (3 of these units must be at the 4000 level) 6 optional course units in geology (GEO) or Environmental Sciences (EVS) at the 3000 or 4000 level 6 elective course units
WINTER	EVS1101 Introduction to Environmental Science GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed) 3 elective course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended)	GEG2320 Introduction to Geomatics (Fall or Winter) GEO2020 Field Studies I GEO2321 Structural Geology and Tectonics GEO2166 Oceanography GEO2352 Geoscience Data Analysis or MAT2377 Probability and Statistics for Engineers (Fall or Winter) or MAT2379 Introduction to Biostatistics (Fall)	GEO3342 Introduction to Hydrogeology GEO3382 Geochemistry 6 elective course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended) 3 electives course units	GEO4010 Honours Project (Fall and Winter) or 6 optional course units in geology (GEO) at the 3000 or 4000 (3 of these units must be at the 4000 level) 3 optional course units in geology (GEO) or Environmental Sciences (EVS) at the 3000 or 4000 level 9 elective course units

Notes GE02166, GE02321, GE02334, GE03191, GE03342: courses is only offered in English once every second year (it is offered in French in opposite years). | BI01109: beyond the requirements of the programs in science. | Certain courses are only offered in English once every second year (it is offered in French in opposite years). | Suggested elective courses: GEO 3167, GEO 4301, GEO 4342, GEO 4382, GEG 3105, GEG 3312, GEG 3102, EVS 4904. | This program can satisfy the academic requirements of the Association of Professional Geoscientists of Ontario. Check the APGO website for current eligible courses which can be used for accreditation. | Most 3000 and 4000 level courses are offered in alternating years with the French equivalent. For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, they must be replaced with electives. For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, they must be replaced with electives. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN GEOLOGY (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1330 Calculus for the Life Sciences I PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	CHM2330 Physical Chemistry: Introduction to the Molecular Properties of Matter or CHM2353 Descriptive Inorganic Chemistry (Fall or Winter) GEO2163 Introduction to Mineralogy GEO2165 Stratigraphy and Sedimentation GEO2352 Geoscience Data Analysis or MAT2377 Probability and Statistics for Engineers or MAT2379 Introduction to Biostatistics 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended)	GEO3163 Igneous Petrology GEO3164 Metamorphic Petrology GEO3165 Carbonate Sedimentology or GEO3166 Siliciclastic Sedimentology 3 elective course units from the Faculty of Arts, Faculty of Education, Faculty of Law, Faculty of Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended) 3 optional course units in BIO, CHM, MAT or PHY at the 2000, 3000 or 4000 level	GEO3920 Field Studies II GEO4010 Honours Project (Fall and Winter) or 6 optional course units in geology (GEO) at the 3000 or 4000 level (3 of these units must be at the 4000 level) 6 optional course units in GEO at the 3000 or 4000 level 3 elective course units
WINTER	EVS1101 Introduction to Environmental Science GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	GEO2020 Field studies I GEO2321 Structural Geology and Tectonics GEO2113 or GEO2166 or GEO2316 or GEO2334 (Fall) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended) 3 elective course units	GEO3167 Mineral Deposits GEO3342 Introduction to Hydrogeology GEO3382 Geochemistry or GEO3191 Applied Geophysics (Fall) 6 elective course units	GEO4010 Honours Project (Fall and Winter) or 6 optional course units in geology (GEO) at the 3000 or 4000 level (3 of these units must be at the 4000 level) 6 optional course units in GEO at the 3000 or 4000 level 6 elective course units

Notes Most of compulsory courses at the 2000 or 3000 level are only offered in English once every second year (it is offered in French in opposite years). | BI01109: beyond the requirements of the programs in science. | This program can satisfy the academic requirements of the Association of Professional Geoscientists of Ontario (APGO). Check APGO website for current eligible courses which can be used for accreditation. | Most 3000 and 4000 level courses are offered in alternating years with the French equivalent. | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace the units with electives. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN GEOLOGY-PHYSICS (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1320 Calculus I PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	CHM2330 Physical Chemistry: Introduction to the Molecular Properties of Matter (Winter) or CHM2353 Descriptive Inorganic Chemistry (Fall) GEO2163 Introduction to Mineralogy GEO2165 Stratigraphy and Sedimentation MAT2322 Calculus III for Engineers (Fall or Winter) MAT2384 Ordinary Differential Equations and Numerical Methods (Fall or Winter) PHY2311 Waves and Optics	GEO3191 Applied Geophysics 6 optional course units in GEO at the 3000 or 4000 level 3 optional course units from (Fall or Winter): PHY2104 Introduction to Circuit Theory and Electronics (Winter) PHY2323 Electricity and Magnetism (Winter) PHY2333 Mechanics (Fall) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended)	GEO4010 Honours Project (Fall and Winter) or 6 optional course units in geology (GEO) at the 3000 or 4000 level (3 of these units must be at the 4000 level) (Fall or Winter) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended) 6 elective course units
WINTER	GEO1111 Introduction to Earth Systems ITI1120 Introduction to Computing I MAT1322 Calculus II MAT1341 Introduction to Linear Algebra PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed)	EVS1101 Introduction to Environmental Science GEO2020 Field studies I GEO2321 Structural Geology and Tectonics PHY2361 Modern Physics	GEO3382 Geochemistry PHY3380 Physics of the Earth 6 optional course units in PHY at the 3000 or 4000 level 3 optional course units from (Fall or Winter): PHY2104 Introduction to Circuit Theory and Electronics (Winter) PHY2323 Electricity and Magnetism (Winter) PHY2333 Mechanics (Fall)	GEO4010 Honours Project (Fall and Winter) or 6 optional course units in geology (GEO) at the 3000 or 4000 level (3 of these units must be at the 4000 level) (Fall or Winter) 6 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management (A language course at the 1000 or 2000 level is strongly recommended) 9 elective course units

Notes GE02121, GE03191, GE03382: These courses are only offered in English once every second year (it is offered in French in opposite years). | BIO1109: beyond the requirements of the programs in science. | Students who take the Geology-Physics program and wish to become registered members of the Association of Professional Geoscientists of Ontario (APGO) must take 21 units in Geology among the optional courses in order to satisfy the requirements of the professional association. | The required 3000-4000 level lecture courses are offered in alternating years with the French equivalent. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

MAJOR IN GEOLOGY (60 UNITS)

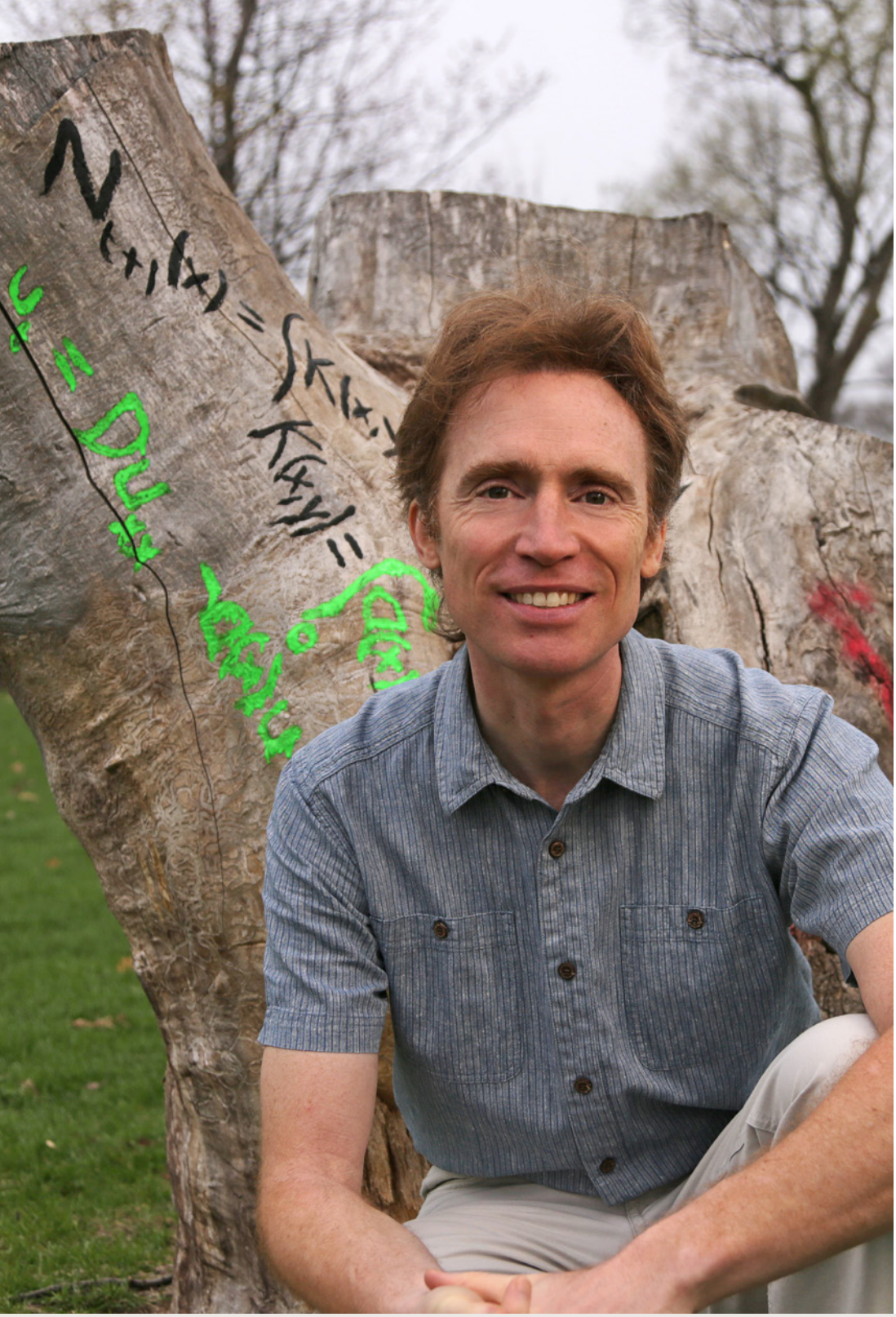
	1ST YEAR (27 units)	2ND YEAR (15 units)	3RD YEAR (12 units)	4TH YEAR (6 units)
FALL	BIO1109 (register to this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1330 Calculus for the Life Sciences I PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	GEO2163 Introduction to Mineralogy GEO2165 Stratigraphy and Sedimentation 6 course units from (Fall or Winter): GEO2020 Field studies I (Winter) GEO2113 Palaeontology (Winter) GEO2166 Oceanography (Winter) GEO2334 Quaternary Geology and Climate Change (Fall)	6 optional course units in GEO at the 3000 or 4000 level	3 optional course units in GEO at the 4000 level
WINTER	EVS1101 Introduction to Environmental Science GEO1111 Introduction to Earth Systems MAT1332 Calculus for the Life Sciences II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed)	GEO2321 Structural Geology and Tectonics	6 optional course units in GEO at the 3000 or 4000 level	3 optional course units in GEO at the 4000 level

Notes BIO1109: beyond the requirements of the programs in science. | This program does not satisfy the academic requirements of the Association of Professional Geoscientists of Ontario. | Most 3000 and 4000 level courses are offered in alternating years with the French equivalent. | Please note that all programs in the Faculty of Science require a minimum of 12 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available when taken as part of an honours degree.

MINOR IN GEOLOGY (30 UNITS)

	1ST YEAR (15 units)	2ND YEAR (9 units)	3RD YEAR (3 units)	4TH YEAR (3 units)
FALL	CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) GEO1115 Introduction to Earth Materials MAT1330 Calculus for the Life Sciences I PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	GEO2163 Introduction to Mineralogy 6 course units from (Fall or Winter): GEO2020 Field studies I GEO2113 Palaeontology GEO2165 Stratigraphy and Sedimentation GEO2321 Structural Geology and Tectonics GEO2334 Quaternary Geology and Climate Change	3 optional course units in GEO at the 3000 or 4000 level (Fall or Winter)	3 optional course units in GEO at the 3000 or 4000 level (Fall or Winter)
WINTER	GEO1111 Introduction to Earth Systems			

Notes This program does not satisfy the requirements of the Association of Professional Geoscientists of Ontario. | Most 3000 and 4000 level courses are offered in alternating years with the French equivalent.



UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Mathematics[c]

Major in Mathematics[c]

Minor in Mathematics[cp]

[c]: Cooperative education is offered as part of four year honours bachelor degrees.

[cp]: Complementary program offered only as a second discipline. Registration starts in second year.

GRADUATE PROGRAMS (MASTERS AND PhD)

Mathematics and Statistics (MSc)

Mathematics and Statistics (PhD)

Bioinformatics (MSc/MCI) (collaborative)

Biostatistics (MSc) (collaborative)

Except for Bioinformatics, all master's programs come in three options: course-based, with project, or with thesis.

CAREER OPPORTUNITIES

Math modeller • cryptographer • computer programmer • computer systems analyst • logistics specialist • mathematician • math teacher

MATHEMATICS

Mathematics (MAT) is much more than numbers and formulae! It is a highly creative field of study that marries precision with intuition and imagination with logic, to produce problem-solving tools. Advances in mathematics lie behind many discoveries that drive the most current technological innovation. The **Honours**, **Major** and **Minor in Mathematics** provide a fundamental training, while the **Joint Honours in Computer Science and Mathematics** adds computing skills.

An innovative and thorough new integrated program in Data Science is now available, combining studies in Mathematics, Statistics and Computer Science in a five-year, two degree program. For the last two programs, admission is through the Faculty of Engineering. Many students do federal government internships and research during their degree. Our programs can be completed in either English, French or a combination of both, a unique offering in Canada.

HONOURS BSc IN MATHEMATICS (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	MAT1320 Calculus I MAT1341 Introduction to Linear Algebra 3 course units in ENG at the 1000 or 2000 level ITI1120 Introduction to Computing I 3 elective course units	MAT2122 Multivariable Calculus MAT2141 Linear Algebra I MAT2362 Foundations of Mathematics MAT2371 Introduction to Probability 3 elective course units	MAT3120 Real Analysis 6 optional course units in MAT at the 3000 or 4000 level MAT3143 Ring Theory 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	3 optional course units in MAT at the 4000 level 3 optional course units in MAT at the 3000 or 4000 level 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 6 elective course units
WINTER	MAT1322 Calculus II MAT1362 Mathematical Reasoning and Proofs 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 6 elective course units	MAT2125 Elementary Real Analysis MAT2143 Algebraic Structures MAT2324 Ordinary Differential Equations and the Laplace Transform 3 course units from: (Fall or Winter) MAT2348 Discrete Mathematics (Fall) MAT2355 Introduction to Geometry MAT2375 Introduction to Statistics 3 elective course units	MAT3121 Complex Analysis I 6 optional course units in MAT at the 3000 or 4000 level MAT 3341 Applied Linear Algebra 3 elective course units	3 optional course units in MAT at the 4000 level 3 optional course units in MAT at the 3000 or 4000 level 9 elective course units

Notes MAT2348: Students interested in discrete mathematics should take MAT2348. | Some 3rd and 4th year courses are offered in alternating years with the French equivalent. | The course MAT3153 cannot be counted for units if you have previously passed MAT4153. You may however take MAT3153 and then subsequently take MAT 4153, and count both for units. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

MAJOR IN MATHEMATICS (60 UNITS)

	1ST YEAR (18 units)	2ND YEAR (24 units)	3RD YEAR (12 units)	4TH YEAR (6 units)
FALL	ITI1120 Introduction to Computing I (Fall or Winter) MAT1320 Calculus I MAT1341 Introduction to Linear Algebra 3 optional course units in English (ENG) at 1000 or 2000 level (Fall or Winter)	MAT2122 Multivariable Calculus MAT2141 Linear Algebra I MAT2371 Introduction to Probability 9 course units from: (Fall or Winter) MAT2324 Ordinary Differential Equations and the Laplace Transform MAT2348 Discrete Mathematics MAT2355 Introduction to Geometry MAT2362 Foundations of Mathematics MAT2375 Introduction to Statistics	6 optional course units in MAT at the 3000 or 4000 level	3 optional course units in MAT at the 4000 level
WINTER	MAT1322 Calculus II MAT1362 Mathematical Reasoning and Proofs	MAT2125 Elementary Real Analysis MAT2143 Algebraic Structures	6 optional course units in MAT at the 3000 or 4000 level	3 optional course units in MAT at the 4000 level

Notes MAT2324 and MAT3341: Students interested in applied mathematics should take these courses. | MAT2348: Students interested in discrete mathematics should take this course. | MAT2362 is strongly recommended and is required for further study of logic. | Students planning to go to graduate school in mathematics must consult the Department of Mathematics and Statistics. | The course MAT3153 cannot be counted for credit if you have previously passed MAT4153. You may however take MAT3153 and then subsequently take MAT4153, and count both for credit. | Some 3rd and 4th year courses are offered in alternating years with the French equivalent. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available when taken as part of an honours degree.

MINOR IN MATHEMATICS (30 UNITS)

	1ST YEAR (12 units)	2ND YEAR (12 units)	3RD YEAR (6 units)
FALL	MAT1320 Calculus I or MAT1330 Calculus for the Life Sciences I MAT1341 Introduction to Linear Algebra	MAT2342 Introduction to Applied Linear Algebra or MAT2141 Linear Algebra I MAT2322 Calculus III for Engineers 6 course units during the year from: (Fall or Winter) MAT2324 Ordinary Differential Equations and the Laplace Transform **or** MAT2384 Ordinary Differential Equations and Numerical Methods MAT2348 Discrete Mathematics MAT2355 Introduction to Geometry MAT2362 Foundations of Mathematics MAT2371 Introduction to Probability MAT2375 Introduction to Statistics **or** MAT2379 Introduction to Biostatistics	3 optional course units in MAT at the 3000 or 4000 level
WINTER	MAT1322 Calculus II or MAT1332 Calculus for the Life Sciences II MAT1362 Mathematical Reasoning and Proofs or MAT1348 Discrete Mathematics for Computing		3 optional course units in MAT at the 3000 or 4000 level

Notes MAT1362: Students interested in the major or honours in mathematics or statistics, the joint honours in mathematics and economics or the honours in financial mathematics and economics must take this course. | MAT1348: Students interested in the joint honours in computer science and mathematics must take this course. | MAT2322 cannot count for units in the major or Honours in mathematics or statistics. Students interested in the major or Honours in mathematics or statistics must take MAT2122 and MAT2125 instead of MAT2322. | MAT2324 and MAT2384: A maximum of 3 course units may be selected amongst these courses. MAT2375 and MAT2379: A maximum of 3 course units may be selected amongst these courses. | MAT2384 and MAT2379: These courses cannot count for units in the major or Honours in mathematics or statistics. | MAT2371 is highly recommended | Some 3rd and 4th year courses are offered in alternating years with the French equivalent.

FINANCIAL MATHEMATICS AND ECONOMICS / MATHEMATICS AND ECONOMICS

Financial decisions rely mostly on quantitative models. Advanced knowledge of mathematics, economics and finance is required. The **Honours in Financial Mathematics and Economics** provides unique, well-balanced training from experts in three disciplines, in conjunction with the Department of Economics and the Telfer School of Management, while the **Joint Honours in Mathematics and Economics** focuses on the use of mathematics in economics. Both programs can lead to positions in financial institutions and governmental agencies. Our graduates get offers from top graduate schools for studies in econometrics and finance. Programs can be completed in either English or French, or a combination of both.

ALEXANDRA ROGERS, 4TH YEAR FINANCIAL MATHEMATICS AND ECONOMICS

As an out of province student, making the move to a new city was quite intimidating, especially in a program many students might find daunting. The University eased the transition by providing all the support needed to excel in this program, from study groups to the Mathematics and Statistics Help Centre to various clubs that the university offers.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Financial Mathematics and Economics[c]

Joint Honours BSc in Mathematics and Economics[c]

[c]: Cooperative education is offered as part of four year honours bachelor degrees.

GRADUATE PROGRAMS (MASTERS AND PhD)

Mathematics and Statistics (PhD)

Mathematics and Statistics (MSc)

All master's programs come in three options: course-based, with project, or with thesis.

CAREER OPPORTUNITIES

Investment analyst • econometrician • quantitative financial analyst • credit risk analyst • actuary

HONOURS BSc IN FINANCIAL MATHEMATICS AND ECONOMICS (120 UNITS)

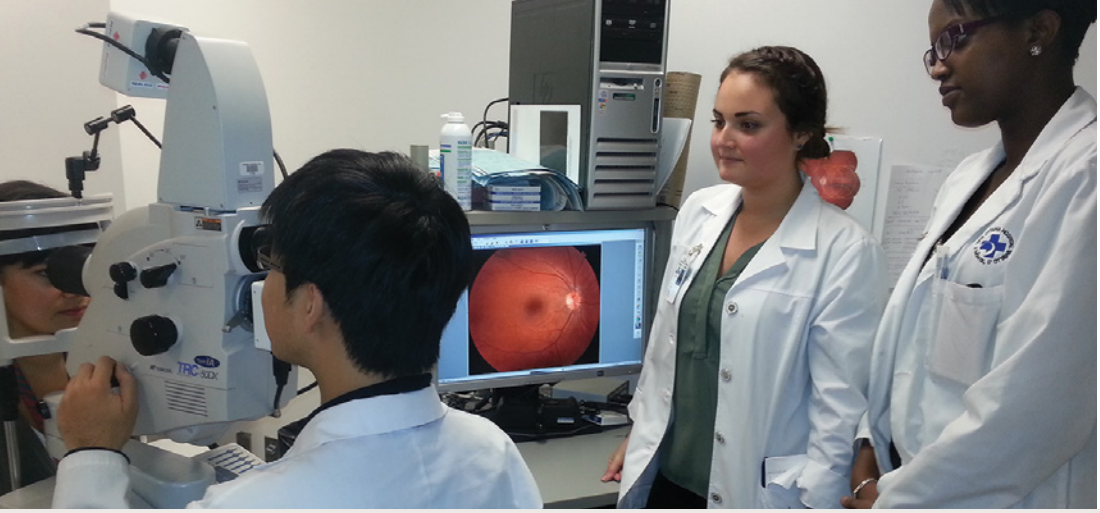
	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	ADM1100 Introduction to Business Management ECO1102 Introduction to Macroeconomics MAT1320 Calculus I MAT1341 Introduction to Linear Algebra 3 elective course units	ECO2142 Macroeconomic Theory I ECO2144 Microeconomic Theory I MAT2122 Multivariable Calculus MAT2141 Linear Algebra I or MAT2342 Introduction to Applied Linear Algebra MAT2371 Introduction to Probability	ADM2352 Finance Theory ADM3350 Corporate Finance MAT3172 Foundations of Probability MAT3375 Regression Analysis PHI2397 Business Ethics	ECO4185 Financial Econometrics 3 course units from (Fall or Winter): ECO3152 Macroeconomic Theory III (Fall) ECO4115 Monetary Theory (Winter) ECO4123 International Finance (Winter) EC04139 Industrial Organization II (Winter) ECO4145 Mathematical Economics II (Winter) ECO4170 Game Theory with Applications in Corporate Finance (Winter) ECO4186 Applied Econometrics (Winter) 3 optional course units in MAT at the 3000 or 4000 level 3 optional course units in MAT at the 4000 level 3 optional course units in ADM at the 3000 or 4000 level
WINTER	ADM1340 Financial Accounting ECO1104 Introduction to Microeconomics MAT1322 Calculus II MAT1362 Mathematical Reasoning and Proofs 3 optional course units in ENG at the 1000	ADM2350 Financial Management ECO2143 Macroeconomic Theory II ECO2145 Microeconomic Theory II MAT2125 Elementary Real Analysis MAT2375 Introduction to Statistics	ECO3153 Microeconomic Theory III MAT2324 Ordinary Differential Equations and the Laplace Transform MAT3379 Introduction to Time Series Analysis 6 optional course units in mathematics (MAT) at the 3000 or 4000 level	ADM4351 Options and Futures 3 optional course units in ADM at the 4000 level 3 optional course units in MAT at the 4000 level 3 course units from (Fall or Winter): ECO3152 Macroeconomic Theory III (Fall) ECO4115 Monetary Theory (Winter) ECO4123 International Finance (Winter) EC04139 Industrial Organization II (Winter) ECO4145 Mathematical Economics II (Winter) ECO4170 Game Theory with Applications in Corporate Finance (Winter) ECO4186 Applied Econometrics (Winter) 3 elective course units (Fall)

Notes Many mathematics (MAT) compulsory lecture courses at the 3000 and 4000 levels are offered in alternating years with the French equivalent. You can choose optional courses from the 4th year if needed to select the language of your choice. (Consult the timetable) Students intending to pursue graduate studies in mathematics should select three courses from MAT3120, MAT3121, MAT3143 and MAT3341 among their elective units in MAT. | Students intending to pursue graduate studies in statistics should select MAT3175, MAT3378 among their optional course units in mathematics (MAT). | MAT4372, MAT4374, MAT4379, MAT4380, MAT4381, MAT4382 and MAT4387 : Recommended optional courses. | MAT4372, MAT4374, MAT4387: Recommended optional courses | It is highly recommended to take ITI1120 as one of your elective courses. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

JOINT HONOURS BSc IN MATHEMATICS AND ECONOMICS (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	ECO1104 Introduction to Microeconomics ENG1100 Workshop in Essay Writing MAT1320 Calculus I MAT1341 Introduction to Linear Algebra 3 elective course units	ECO2142 Macroeconomic Theory I ECO2144 Microeconomic Theory I MAT2122 Multivariable Calculus MAT2141 Linear Algebra I or MAT2342 Introduction to Applied Linear Algebra MAT2371 Introduction to Probability	ECO3152 Macroeconomic Theory III 6 optional course units in ECO at the 3000 or 4000 level 3 course units from (Fall or Winter): MAT2143 Algebraic Structures (Winter) MAT2324 Ordinary Differential Equations and the Laplace Transform (Winter) MAT2348 Discrete Mathematics MAT2355 Introduction to Geometry (Winter) MAT2362 Foundations of Mathematics 3 optional course units in MAT at the 3000 or 4000 level	3 optional course units in ECO at the 4000 level 3 optional course units in MAT at the 3000 or 4000 level 3 optional course units in MAT at the 4000 level 6 elective course units
WINTER	ECO1102 Introduction to Macroeconomics ENG1120 Literature and Composition I: Prose Fiction or ENG1121 Literature and Composition II: Drama and Poetry MAT1322 Calculus II MAT1362 Mathematical Reasoning and Proofs 3 elective course units	ECO2143 Macroeconomic Theory II ECO2145 Microeconomic Theory II MAT2125 Elementary Real Analysis MAT2375 Introduction to Statistics 3 course units from (Fall or Winter): MAT2143 Algebraic Structures MAT2324 Ordinary Differential Equations and the Laplace Transform MAT2348 Discrete Mathematics (Fall) MAT2355 Introduction to Geometry MAT2362 Foundations of Mathematics (Fall)	ECO3151 Introduction to Econometrics ECO3153 Microeconomic Theory III 3 optional course units in ECO at the 3000 or 4000 level 6 optional course units in MAT at the 3000 or 4000 level	3 optional course units in ECO at the 4000 level 3 optional course units in MAT at the 4000 level 9 elective course units

Notes MAT2141: Students interested in graduate studies in mathematics should choose MAT2141. | MAT2362 is strongly recommended and is required for further study of logic. | Students planning to go to graduate studies in mathematics and statistics must consult the Department of Mathematics and Statistics for their choices of optional courses. | Some 3rd and 4th year courses are offered in alternating years with the French equivalent. | It is highly recommended to take ITI1120 as one of your elective courses. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.



UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Ophthalmic Medical Technology

CAREER OPPORTUNITIES

Ophthalmology clinics • hospitals or institutions • clinical research • diagnostic technology industry • refractive laser centres • pharmaceutical industry

OPHTHALMIC MEDICAL TECHNOLOGY

The complexity of ophthalmic medicine has been growing steadily, and with it, the demand for well-trained allied health specialists in this critical area of eye care.

Students in the ophthalmic medical technology program work with the latest technologies and as part of the health care team at the University of Ottawa Eye Institute. This integrated education prepares graduates for a challenging and rewarding career as an ophthalmic medical technologist (OMT). After successful completion of the program, students are eligible to sit for the certification exams given by the International Joint Commission on Allied Health Personnel in Ophthalmology. Graduates from the OMT program are sought after across the country and internationally.

The ophthalmic medical technology program begins with two years of core sciences, followed by two years of studies dealing specifically with ophthalmology and visual science. Courses in years three and four are delivered at the University of Ottawa Eye Institute at The Ottawa Hospital. They integrate didactic learning with hands-on training in the health care environment. Students work alongside and learn from other health care providers and ophthalmologists.

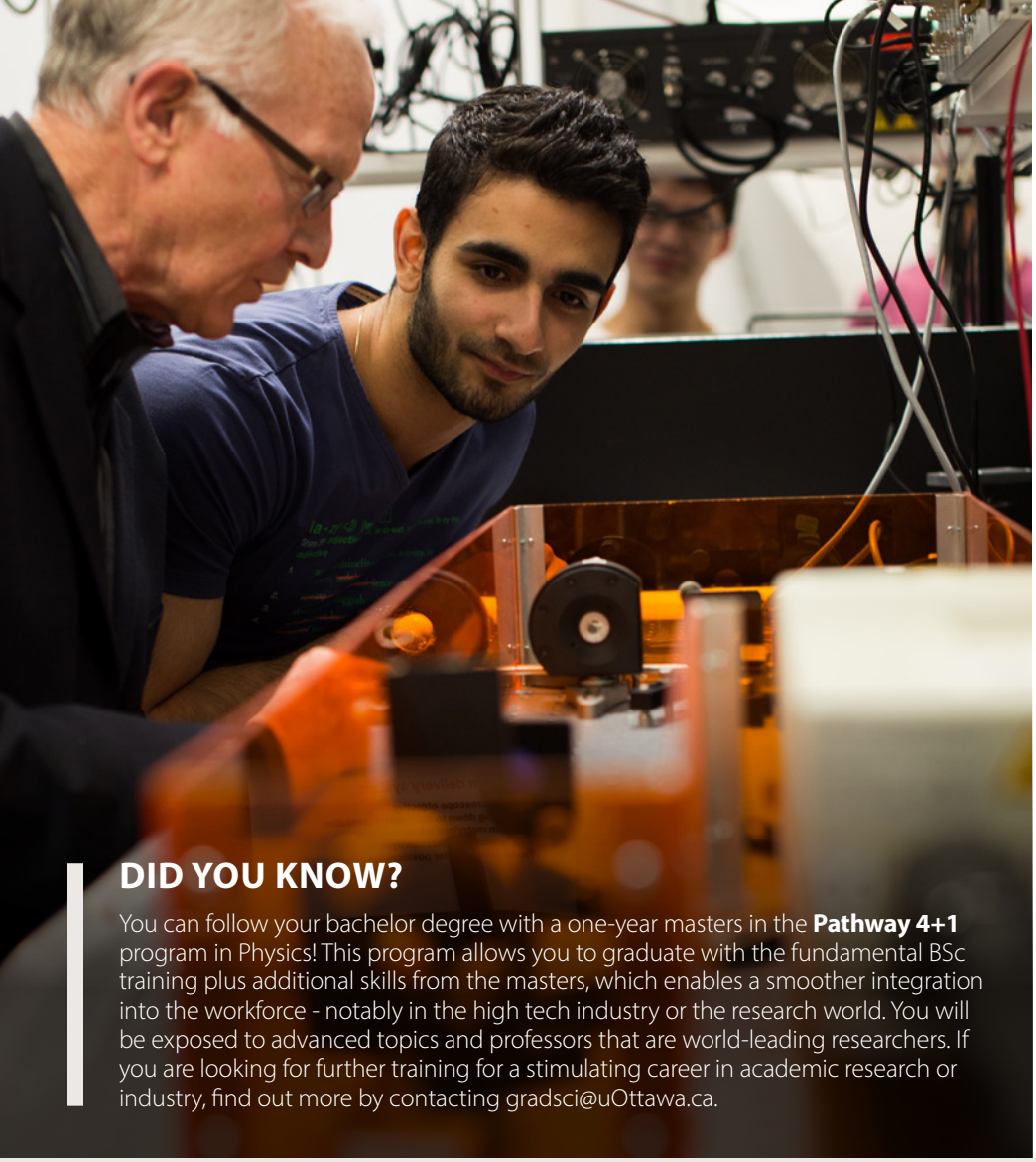
Admission to the third and fourth years of this program is limited. To qualify, a student must have successfully completed the compulsory 1000- and 2000-level courses with a minimum cumulative grade point average (CPGA) of 6.0. Applicants meeting these requirements will be interviewed by the admission committee to determine which candidates are most likely to succeed in the field.

Applicants are advised and encouraged, early in the program, to visit the Eye Institute for a tour and to meet with ophthalmic personnel in order to gain an understanding of the profession. Students that are not accepted into the third and fourth years of the program can transfer into another program within the Faculty of Science. The first two years are similar to the first two years in biology, biochemistry and biopharmaceutical science. They should meet with an academic advisor to establish the list of courses that will be credited to the new program.

HONOURS BSc IN OPHTHALMIC MEDICAL TECHNOLOGY (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)		3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	BIO1109 (register for this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1330 Calculus for the Life Sciences I PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) HSS1101 Determinants of Health or PSY1102 Introduction to Psychology: Applications (Fall or Winter)	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II MAT2379 Introduction to Biostatistics 6 optional course units at the 2000, 3000 or 4000 level offered by the Faculty of Science	**Acceptance into the third year of this bachelor's degree program is competitive and includes an interview with the admissions committee. To be considered, students must have successfully completed two full years of prerequisite courses (60 units) with a minimum CGPA of 6.0. The committee selects candidates on the basis of many factors, and it may consider strong, well-rounded candidates from a science background who may or may not have completed all the prerequisites. Each year, a maximum of four students are selected and students should be aware that meeting the basic requirements does not guarantee admission to the program.**	HSS3101 Health Research: Quantitative and Qualitative Approaches OMT3122 Ocular Anatomy and Physiology OMT3123 Optics, Refractometry and Optical Instruments OMT3124 Basic Diagnostics I OMT3125 Clinical Application I OMT3128 Ophthalmic Basic Science Seminars OMT3231 Introduction to Ophthalmic Technology: Basic Skills-I	OMT4122 Advanced Diagnostics OMT4123 Ophthalmic Pharmacology OMT4125 Ophthalmic Basic Science Seminars OMT4201 Basic Skills II OMT4224 Clinical Application-II
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I MAT1332 Calculus for the Life Sciences II PHY1322 Principles of Physics II ENG1100 Workshop in Essay Writing (Fall or Winter)	BCH2333 Introduction to Biochemistry BIO2133 Genetics PHI2396 Bioethics 6 optional course units at the 2000, 3000 or 4000 level offered by the Faculty of Science		OMT3126 Ophthalmic Subspecialties OMT3127 Basic Diagnostics II	OMT4126 Specialized Diagnostic Evaluations OMT4127 Advanced Diagnostics II OMT4128 Abnormalities of the Eye and Common Ocular Complaints

Notes BIO1109: This course is beyond the requirements of the programs in science. | OMT3125, OMT3128, OMT3231, OMT4125, OMT4201, OMT4224: These courses runs from September to April. | The minimum CGPA required to be on good academic standing is 5.0.



DID YOU KNOW?

You can follow your bachelor degree with a one-year masters in the **Pathway 4+1** program in Physics! This program allows you to graduate with the fundamental BSc training plus additional skills from the masters, which enables a smoother integration into the workforce - notably in the high tech industry or the research world. You will be exposed to advanced topics and professors that are world-leading researchers. If you are looking for further training for a stimulating career in academic research or industry, find out more by contacting gradsci@uOttawa.ca.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Physics[c]

Honours BSc in Physics-Mathematics[c]

Options: Biological Physics[c], Photonics[c]

Major in Physics[c]

Minor in Physics[cp]

Minor in Biophysics[cp]

[c]: Cooperative education is offered as part of four-year honours bachelor degrees.

[cp]: Complementary program offered only as a second discipline. Registration starts in second year.

GRADUATE PROGRAMS (MASTERS AND PhD)

Master of Science (MSc)

Doctorate (PhD)

CAREER OPPORTUNITIES

Physicist • materials scientist • biophysicist • telecommunications specialist • aerospace researcher • geophysicist • medical physicist • astrophysicist • photonics researcher • meteorologist • physics teacher • patent lawyer • financial analyst • medical doctor

PHYSICS, PHYSICS-MATHEMATICS

Why is our world the way it is? How can we understand and explain what we observe around us, from the smallest sub-atomic particles to the largest galaxies? How can we apply this understanding to manipulate our world? Of course studying physics (PHY) gives insight into the fundamental laws of nature.

But an education in physics gives so much more. The rigorous training our students receive in analyzing and understanding complex problems is of considerable value to many future career directions. While many of our graduates have found careers in universities and in the high-tech sector as research and development scientists, others have used their physics degrees as a springboard for careers in finance, administration, medicine, management and education. The range of career opportunities is perhaps wider than for any other scientifically trained group.

From original ground breaking discoveries, to the development of new and revolutionary technologies, to the decoding of the stock market, physicists have revolutionized the way we live our lives. Our professors and our graduates are an important part of this chain. Many of our professors have also been recognized as superb teachers and have been widely recognized as world-class researchers in their respective fields of expertise.

The research conducted by the professors in the Department of Physics is concentrated in several sub-specialties, including the physics of biological and complex systems, condensed matter physics, photonics, and the physics of geomaterials. Depending upon their choice of program, undergraduate students will have the opportunity to take courses and participate in research projects in these specialized areas.

The Department of Physics offers an honours BSc with a specialization in physics as well as three other honours BSc programs. The specialization in physics-mathematics provides enriched mathematics training within a physics program. The specialization in physics with biological physics option prepares the student for cutting edge research in biophysics and physical phenomena in the life sciences. The specialization in physics with photonics option combines a well-rounded training in fundamental physics with a state-of-the-art training in the technology driven area of photonics. The Department also offers a major in physics, which may form the core of an honours BSc when combined with a major or a minor in another discipline.

The Department of Physics also has a strong graduate program, leading to a MSc or PhD degree. BSc graduates who qualify for the accelerated stream can obtain a MSc degree in only one year.

HONOURS BSc IN PHYSICS (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	MAT1320 Calculus I MAT1341 Introduction to Linear Algebra (Fall or Winter) PHY1121 B00 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 elective course units	MAT2122 Multivariable Calculus or MAT2322 Calculus III for Engineers (Fall or Winter) MAT2324 Ordinary Differential Equations and the Laplace Transform (Winter) or MAT2384 Ordinary Differential Equations and Numerical Methods (Fall or Winter) PHY2311 Waves and Optics PHY2333 Mechanics 3 optional course units in MAT at the 2000, 3000 or 4000 level, excluding MAT2379	PHY3341 Theoretical Physics PHY3350 Thermodynamics PHY3370 Introductory Quantum Mechanics PHY3902 Physics and Applied Physics Laboratory I 3 elective course units	PHY40061 Physics Research Project or PHY4903 Physics Laboratory + PHY4906 Physics Project (Fall and Winter) PHY4370 Quantum Mechanics PHY4382 Introduction to Solid State Physics 3 optional course units in PHY at the 4000 or 5000 level (May be taken in 3rd year if prerequisites satisfied.) 3 elective course units
WINTER	MAT1322 Calculus II PHY1112 Introduction to Computational Physics PHY1122 C00 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 6 elective course units (Fall or Winter)	PHY2104 Introduction to Circuit Theory and Electronics PHY2323 Electricity and Magnetism PHY2361 Modern Physics 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 elective course units (Fall or Winter)	PHY3320 Electromagnetic Theory PHY3355 Statistical Thermodynamics PHY3904 Physics and Applied Physics Laboratory II 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 elective course units	PHY40062 Physics Research Project or PHY4903 Physics Laboratory + PHY4906 Physics Project (Fall and Winter) 6 optional course units in PHY at the 4000 or 5000 level 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 elective course units

Notes Of the 24 elective units, some breadth in other sciences is recommended and the following course is recommended in particular: CHM1311, (MAT2141 or MAT2342) or (MAT2371 or MAT2377) | (MAT2141 or MAT2342) or (MAT2371 or MAT2377) is recommended as an optional course in MAT. | Specialization programs are also offered in Physics with Biological Physics option, Photonics Option and in Physics-Mathematics; please consult the relevant tables for details. | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace the units with electives. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN PHYSICS - BIOLOGICAL PHYSICS OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1320 Calculus I MAT1341 Introduction to Linear Algebra (Fall or Winter) PHY1121 B00 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	BIO3153 Cell Biology MAT2122 Multivariable Calculus or MAT2322 Calculus III for Engineers PHY2311 Waves and Optics PHY2333 Mechanics 3 optional course units in BIO at the 2000, 3000 or 4000 level	PHY3325 Introduction to Molecular Biophysics (to be taken in 3rd or 4th year) PHY3341 Theoretical Physics PHY3350 Thermodynamics PHY3370 Introductory Quantum Mechanics PHY3902 Physics and Applied Physics Laboratory I	PHY40061 Physics Research Project 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 9 elective course units
WINTER	BIO1140 Introduction to Cell Biology MAT1322 Calculus II PHY1122 C00 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed) 3 elective course units (Fall or Winter) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	MAT2324 Ordinary Differential Equations and the Laplace Transform or MAT2384 Ordinary Differential Equations and Numerical Methods (Fall or Winter) PHY2104 Introduction to Circuit Theory and Electronics PHY2323 Electricity and Magnetism PHY2325 Physics in Biology PHY2361 Modern Physics	PHY3320 Electromagnetic Theory PHY3355 Statistical Thermodynamics PHY3904 Physics and Applied Physics Laboratory II 3 optional course units in BIO at the 2000, 3000 or 4000 level 3 optional course units in MAT at the 2000, 3000 or 4000 level, excluding MAT2379 (Fall or Winter)	PHY40062 Physics Research Project PHY4322 Biological Physics 6 elective course units 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management

Notes Of the 18 elective units, some breadth in other sciences is recommended and the following course are recommended in particular: CHM1321, GNG1106 or ITI1120, (MAT2141 or MAT2342) or (MAT2371 or MAT2377). | (MAT2141 or MAT2342) or (MAT2371 or MAT2377) is recommended. | PHY3325 is not offered in the 2023-2024 academic year | PHY4006 During the fourth year, the student must either do a research project (PHY4006), or PHY4903 and PHY4906 | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace the units with electives. | Some 3000 and 4000 level courses in PHY are offered in alternating years with the French equivalent. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN PHYSICS - PHOTONICS OPTION (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	MAT1320 Calculus I MAT1341 Introduction to Linear Algebra (Fall or Winter) PHY1121 B00 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 elective course units offered by the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	MAT2122 Multivariable Calculus or MAT2322 Calculus III for Engineers PHY2311 Waves and Optics PHY2333 Mechanics 3 elective course units offered by the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 elective course units	PHY3341 Theoretical Physics PHY3350 Thermodynamics PHY3370 Introductory Quantum Mechanics PHY3902 Physics and Applied Physics Laboratory I **Group A** PHY4311 Introduction to Photonics – Lasers	PHY4006 Physics Research Project (Fall and Winter) or PHY4906 Physics Project (Fall and Winter) plus 3 optional course units at the 2000, 3000 or 4000 level from the faculties of Science or Engineering PHY4370 Quantum Mechanics PHY4382 Introduction to Solid State Physics 3 elective course units **Group B** PHY3310 Photonics Measurement Techniques
WINTER	MAT1322 Calculus II PHY1112 Introduction to Computational Physics PHY1122 C00 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed) 6 elective course units 3 elective course units offered by the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	MAT2324 Ordinary Differential Equations and the Laplace Transform or MAT2384 Ordinary Differential Equations and Numerical Methods (Fall or Winter) PHY2104 Introduction to Circuit Theory and Electronics PHY2323 Electricity and Magnetism PHY2361 Modern Physics 3 elective course units	PHY3320 Electromagnetic Theory PHY3355 Statistical Thermodynamics 6 elective course units **Group A** PHY4320 Introduction to Quantum Optics	ELG4178 Optical Communications and Networking PHY4006 Physics Research Project (Fall and Winter) or PHY4906 Physics Project (Fall and Winter) plus 3 optional course units at the 2000, 3000 or 4000 level from the faculties of Science or Engineering 3 elective course units offered by the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 elective course units **Group B** PHY4375 Atomic, Molecular and Optical Physics
			PHY3310, PHY4311, PHY4320 and PHY4375 are offered in alternating years in English. Take Group A in 3rd year and Group B in 4th year, or vice versa, ensure they are taken when offered.	

Notes Of the 24 elective course units, some breadth in other sciences is recommended and the following courses are recommended in particular: CHM1311, (MAT2141 or MAT2342), (MAT2371 or MAT2377) | Some 3000 and 4000 level courses in PHY are offered in alternating years with the French equivalent. | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace the units with elective course units. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

HONOURS BSc IN PHYSICS-MATHEMATICS (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	MAT1320 Calculus I MAT1341 Introduction to Linear Algebra PHY1121 B00 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed) 3 elective course units	MAT2122 Multivariable Calculus MAT2141 Linear Algebra I MAT2371 Introduction to Probability (Fall) or MAT2377 Probability and Statistics for Engineers (Fall or Winter) PHY2311 Waves and Optics PHY2333 Mechanics	PHY3341 Theoretical Physics PHY3350 Thermodynamics PHY3370 Introductory Quantum Mechanics PHY3902 Physics and Applied Physics Laboratory I 3 elective course units	PHY4370 Quantum Mechanics PHY4382 Introduction to Solid State Physics or PHY49061 Physics Project (Fall or Winter) 3 optional course units in PHY at the 4000 or 5000 level (May be taken anytime in 3rd or 4th year if prerequisites satisfied.) 3 optional course units in MAT at the 3000 or 4000 level excluding MAT3320 (May be taken anytime in 3rd or 4th year if prerequisites satisfied.) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management
WINTER	MAT1322 Calculus II PHY1112 Introduction to Computational Physics PHY1122 C00 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed) MAT1362 Mathematical Reasoning and Proofs (Fall) or MAT1348 Discrete Mathematics for Computing (Winter) 3 elective course units 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	MAT2125 Elementary Real Analysis MAT2324 Ordinary Differential Equations and the Laplace Transform (Winter) or MAT2384 Ordinary Differential Equations and Numerical Methods (Fall or Winter) PHY2104 Introduction to Circuit Theory and Electronics PHY2323 Electricity and Magnetism PHY2361 Modern Physics	MAT2143 Algebraic Structures PHY3320 Electromagnetic Theory PHY3355 Statistical Thermodynamics 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 elective course units	3 optional course units in PHY at the 4000 or 5000 level (May be taken anytime in 3rd or 4th year if prerequisites satisfied.) 3 optional course units in MAT at the 3000 or 4000 level excluding MAT3320 (May be taken anytime in 3rd or 4th year if prerequisites satisfied.) 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 6 elective course units

Notes MAT1348 is a prerequisite for most second year computer science courses (CSI). | MAT2371 is a prerequisite for most further MAT courses in probability and statistics. | MAT3130, MAT3155, MAT3341, MAT3380, MAT3395, MAT4183,MAT4381, MAT4385, MAT4386, MAT4387, MAT4388: courses recommended by the Department as optional course in MAT). | Some 3000 and 4000 level courses in MAT and PHY are offered in alternating years with the French equivalent. | For students registered in the Faculty of Science: If the components of your program of study require common compulsory courses, you will have to replace the units with electives. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

MAJOR IN PHYSICS (54 UNITS)

	1ST YEAR (15 units)	2ND YEAR (21 units)	3RD and 4TH YEAR (18 units)
FALL	MAT1320 Calculus I MAT1341 Introduction to Linear Algebra (Fall or Winter) PHY1121 Fundamentals of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	MAT2122 Multivariable Calculus or MAT2322 Calculus III for Engineers (Fall or Winter) PHY2311 Waves and Optics PHY2333 Mechanics	PHY3350 (Fall of 3rd or 4th year) PHY3902 (Fall of 3rd or 4th year) **Offered in Fall or Winter of 3rd or 4th year:** At least 12 course units of additional lecture courses in physics (PHY) at the 3000 or 4000 level, excluding PHY3902, PHY3903, PHY3904, PHY4006, PHY4327, PHY4903 and PHY4906; at least six of the 12 course units must be selected from: PHY3320 (Winter) PHY3341 (Fall) PHY3355 (Winter) PHY3370 (Fall)
WINTER	MAT1322 Calculus II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed)	MAT2324 Ordinary Differential Equations and the Laplace Transform or MAT2384 Ordinary Differential Equations and Numerical Methods (Fall or Winter) PHY2104 Introduction to Circuit Theory and Electronics PHY2323 Electricity and Magnetism PHY2361 Modern Physics	**Offered in Fall or Winter of 3rd or 4th year:** At least 12 course units of additional lecture courses in physics (PHY) at the 3000 or 4000 level, excluding PHY3902, PHY3903, PHY3904, PHY4006, PHY4327, PHY4903 and PHY4906; at least six of the 12 course units must be selected from: PHY3320 (Winter) PHY3341 (Fall) PHY3355 (Winter) PHY3370 (Fall)

Notes PHY3320 PHY3341, PHY3355, PHY3370: These courses are recommended for students intending to pursue graduate studies in physics. | PHY3341 is a corequisite for PHY3370. | Some physics courses are offered in alternating years with the French equivalent. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available when taken as part of an honours degree.

MINOR IN PHYSICS (30 UNITS)

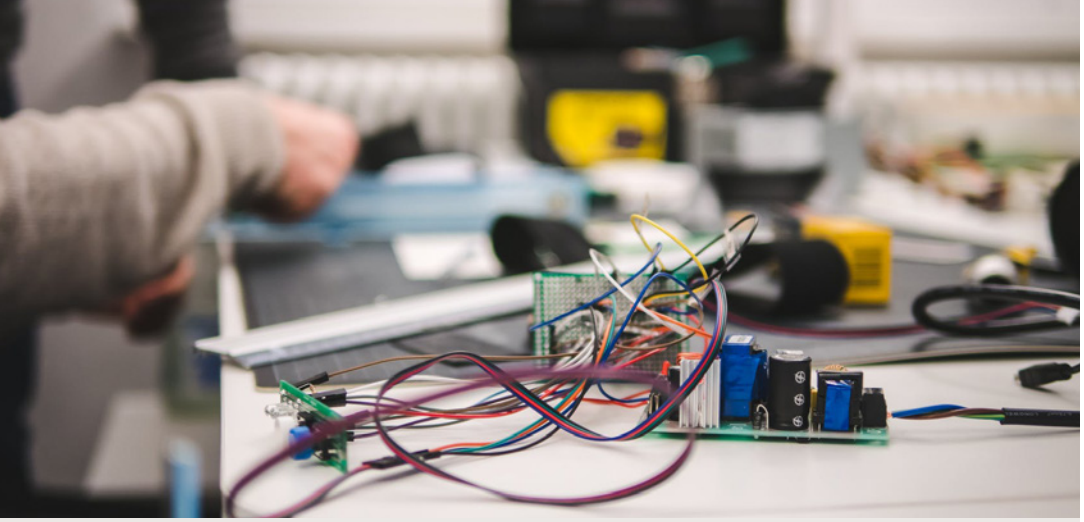
	1ST YEAR (15 units)	2ND YEAR (12 units)	3RD YEAR (3 units)
FALL	MAT1320 Calculus I or MAT1330 Calculus for the Life Sciences I MAT1341 Introduction to Linear Algebra (Fall or Winter) PHY1121 Fundamentals of Physics I or PHY1321 Principles of Physics I	6 optional course units from: PHY2311 Waves and Optics (Fall) PHY2333 Mechanics (Fall) PHY2100 Fundamentals of Applied Physics III (Winter) or PHY2323 Electricity and Magnetism (Winter)	A minimum of 3 optional course units in PHY at the 3000 or 4000 level (Fall or Winter; may be taken in 3rd or 4th year) (Excluding PHY3902, PHY3903, PHY3904, PHY4006, PHY4327, PHY4903, PHY4906)
WINTER	MAT1322 Calculus II or MAT1332 Calculus for the Life Sciences II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II	PHY2104 Introduction to Circuit Theory and Electronics PHY2361 Modern Physics	

Notes PHY1321 may be replaced by PHY1331. | PHY2100 and PHY2323 cannot be combined for credit.

MINOR IN BIOPHYSICS (33 UNITS)

	1ST YEAR (18 units)	2ND YEAR (6 units)	3RD YEAR (9 units)
FALL	CHM1311 Principles of Chemistry or CHM1301 Principles of Chemistry (if 4U Chemistry not completed) MAT1320 Calculus I or MAT1330 Calculus for the Life Sciences I PHY1121 Fundamentals of Physics I or PHY1321 Principles of Physics I or PHY1331 Principles of Physics I (if 4U Physics not completed)	3 optional course units in PHY at the 2000, 3000 or 4000 level	BIO3153 Cell Biology PHY3325 Introduction to Molecular Biophysics (Fall 3rd or 4th year)
WINTER	BIO1140 Introduction to Cell Biology MAT1322 Calculus II or MAT1332 Calculus for the Life Sciences II PHY1122 Fundamentals of Physics II or PHY1322 Principles of Physics II (if 4U Physics not completed)	PHY2325 Physics in Biology	PHY4322 Biological Physics

Notes MAT1341 is a prerequisite to some second year physics courses; check the university calendar. Students interested in applying for graduate studies in biological physics in the Department of Physics at uOttawa are recommended to take some of the following courses: PHY2361, PHY3350, PHY3355, MAT2324 or MAT2384. For more details the interested student should consult with the potential research supervisor of the Department of Physics.



UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Physics / BASc in Electrical Engineering[c]

[c]: Cooperative education is offered as part of four year honours bachelor degrees.

GRADUATE PROGRAMS (MASTERS AND PhD)

Master and Doctorate in allied disciplines.

CAREER OPPORTUNITIES

Physicist • electrical engineer • industrial research and development scientist or engineer • materials scientist • avionics engineer • power systems and renewable energy engineer • biomedical researcher or engineer

PHYSICS AND ELECTRICAL ENGINEERING

Discover the fundamental laws of nature, and then apply this knowledge in the design of breakthrough technologies that will transform our society. While physics probes big questions, from the origin of the universe to the workings of the quantum world, electrical engineering underlies the technologies that are ubiquitous in our modern world, from power generation to the computer chip.

By teaching you the foundations of how nature works, and then how to innovate with this knowledge, this integrated program will uniquely equip you to tackle societal and technological problems facing us and future generations. In five years you will earn two degrees, one in physics and one in electrical engineering, and will be truly challenged to defy the conventional.

HONOURS BSc IN PHYSICS AND BASc IN ELECTRICAL ENGINEERING (159 UNITS)

	1ST YEAR (30 units)	2ND YEAR (33 units)	3RD YEAR (30 units)	4TH YEAR (33 units)	5TH YEAR (33 units)
FALL	CHM1311 Principles of Chemistry GNG1106 Fundamentals of Engineering Computation (Fall or Winter) MAT1320 Calculus I MAT1341 Introduction to Linear Algebra (Fall or Winter) PHY1121 B00 Fundamentals of Physics I	CEG2136 Computer Architecture I ELG2138 Circuit Theory I MAT2322 Calculus III for Engineers (Fall or Winter) MAT2384 Ordinary Differential Equations and Numerical Methods (Fall or Winter) PHY2311 Waves and Optics PHY2333 Mechanics	CEG3136 Computer Architecture II ELG3106 Electromagnetic Engineering ELG3125 Signal and System Analysis ELG3136 Electronics II 3 course units of complementary studies elective	ELG4912 Electrical Engineering Design Project: Part I PHY3341 Theoretical Physics PHY3350 Thermodynamics PHY3370 Introductory Quantum Mechanics HIS2129 Technology, Society and Environment since 1800 (Fall) or PHI2394 Scientific Thought and Social Values 3 course units to be selected from the list below according to the chosen option	PHY4006 Physics Research Project PHY4370 Quantum Mechanics PHY4382 Introduction to Solid State Physics 6 course units to be selected from the list below according to the chosen option 3 course units of complementary studies elective
WINTER	ENG1112 Technical Report Writing (Fall or Winter) GNG1103 Engineering Design ITI1100 Digital Systems I MAT1322 Calculus II PHY1122 C00 Fundamentals of Physics II	GNG2101 Introduction to product development and management for engineers and computer scientists (Fall or Winter) ELG2136 Electronics I ELG2137 Circuit Theory II PHY2323 Electricity and Magnetism PHY2361 Modern Physics	ELG3126 Random Signals and Systems ELG3137 Fundamentals of Semiconductor Devices ELG3155 Introduction to Control Systems ELG3175 Introduction to Communication Systems ELG3316 Electric Machines and Power Systems	ELG2911 Professional Practice in Information Technology and Engineering ELG4913 Electrical Engineering Design Project: Part II PHY3355 Statistical Thermodynamics 3 course units to be selected from the list below according to the chosen option 3 optional course units in MAT at the 2000, 3000 or 4000 level, excluding MAT2379	PHY4006 Physics Research Project 6 course units to be selected from the list below according to the chosen option 6 optional course units in PHY at the 4000 or 5000 level

Notes (MAT2141 or MAT2342) or (MAT2371 or MAT2377) is recommended | PHY4323: Students in the Power and Sustainability Option must take PHY4324, which may need to be taken in the winter of the fourth year Course units of complementary studies electives: for a complete list of courses, consult the Faculty of Engineering's website. | Compulsory electrical engineering/computer engineering (ELG/CEG) 4000 level courses (students must choose one of the following options): a) Communications option: ELG4118, ELG4139, ELG4156, ELG4176, ELG4177, ELG4179 b) Systems Engineering option: CEG4158, ELG4137, ELG4156, ELG4157, ELG4159, ELG4177 c) Electronics option: ELG4115, ELG4117, ELG4137, ELG4139, ELG4176, ELG4177 d) Microwave and Photonic Engineering option: ELG4115, ELG4117, ELG4118, ELG4139, ELG4178, ELG4179 e) Power and Sustainable Energy option: ELG4125, ELG4126, ELG4139, ELG4157, ELG4159, ELG4179 | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

UNDERGRADUATE STUDIES (BACHELOR)

Honours BSc in Statistics[c]

Major in Statistics[c]

Minor in Statistics[cp]

[c]: Cooperative education is offered as part of four year honours bachelor degrees.

[cp]: Complementary program offered only as a second discipline. Registration starts in second year.

GRADUATE PROGRAMS (MASTERS AND PhD)

Mathematics and Statistics (MSc)

Mathematics and Statistics (PhD)

Bioinformatics (MSc/MCI) (collaborative)

Biostatistics (MSc) (collaborative)

Except for Bioinformatics, all master's programs come in three options: course-based, with project, or with thesis.

CAREER OPPORTUNITIES

Business intelligence analyst • data analyst • data scientist • statistician

STATISTICS

Every field of research is feeling the impact of large volumes of data. Every business, government department and non-governmental organization is collecting data about its clients and products. To navigate the world of data, you need advanced statistical skills. Our **Honours, Major** and **Minor in Statistics** provide extensive training with many internship opportunities. Graduates find jobs in industry or government, in particular, with Statistics Canada. The program is accredited by the Statistical Society of Canada (SSC) and graduates can apply for A.Stat. designation. Programs can be completed in either English or French, or a combination of both.

HONOURS BSc IN STATISTICS (120 UNITS)

	1ST YEAR (30 units)	2ND YEAR (30 units)	3RD YEAR (30 units)	4TH YEAR (30 units)
FALL	ITI1120 Introduction to Computing I (Fall or Winter) MAT1320 Calculus I MAT1341 Introduction to Linear Algebra 3 course units in ENG at the 1000 or 2000 level 3 elective course units	MAT2122 Multivariable Calculus MAT2141 Linear Algebra I or MAT2342 Introduction to Applied Linear Algebra MAT2371 Introduction to Probability 3 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management 3 elective course units	MAT3172 Foundations of Probability MAT3375 Regression Analysis 9 elective course units	MAT4379 Survey Sampling (Fall) 6 course units from: (Fall or Winter) MAT3341 Applied Linear Algebra (Winter) MAT3373 Methods of Machine Learning MAT4371 Applied Probability (Winter) MAT4374 Modern Computational Statistics (Winter) MAT4375 Multivariate Statistical Methods (Winter) MAT4376 Topics in Statistics (Fall) MAT4377 Topics in Applied Probability (Winter) MAT4378 Categorical Data Analysis in Biostatistics (Fall) MAT4380 Advanced Regression (Winter) MAT4381 Bayesian Inference (Winter) MAT4382 Generalized Linear Models (Winter) MAT4383 Statistics Laboratory 15 optional course units in MAT at the 3000 or 4000 level 6 elective course units (Fall or Winter)
WINTER	MAT1322 Calculus II MAT1362 Mathematical Reasoning and Proofs 9 elective course units	MAT2125 Elementary Real Analysis MAT2324 Ordinary Differential Equations and the Laplace Transform or MAT2384 Ordinary Differential Equations and Numerical Methods MAT2375 Introduction to Statistics 6 elective course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management	MAT3175 Introduction to Mathematical Statistics MAT3378 Analysis of experimental designs MAT3379 Introduction to Time Series 6 elective course units	

Notes This program is accredited by the Statistical Society of Canada (SSC). To satisfy the requirements for the professional title of A. Stat. from the SSC, students must add to the Honours in statistics the equivalent of a minor in a field other than MAT. Contact the Department of Mathematics and Statistics for details. | The following courses are recommended for the students interested in pursuing graduate studies in probability or statistics: MAT3120 and MAT3121. Other courses in probability and statistics which may be of interest include: MAT4170, MAT4171 and MAT4372. | Most 3000 and 4000 level courses are offered in alternating years with the French equivalent. | Co-operative education and the French Immersion stream are available with this program. | The minimum CGPA required to be in good academic standing is 5.0.

MAJOR IN STATISTICS (60 UNITS)

	1ST YEAR (18 units)	2ND YEAR (15 units)	3RD YEAR (18 units)	4TH YEAR (9 units)
FALL	ITI1120 Introduction to Computing I (Fall or Winter) MAT1320 Calculus I MAT1341 Introduction to Linear Algebra 3 optionnal course units in English (ENG) at the 1000 or 2000 level (Fall or Winter)	MAT2122 Multivariable Calculus MAT2141 Linear Algebra I or MAT2342 Introduction to Applied Linear Algebra MAT2371 Introduction to Probability	MAT3375 Regression Analysis 3 optional course units from the list below MAT4379 Survey Sampling	6 optional course units in MAT at the 3000 or 4000 level
WINTER	MAT1322 Calculus II MAT1362 Mathematical Reasoning and Proofs	MAT2125 Elementary Real Analysis MAT2375 Introduction to Statistics	MAT3378 Analysis of Experimental Designs 6 optional course units from the list below	3 optional course units from the list below

Notes 12 course units from the following list must be taken. Courses accredited by the Statistical Society of Canada (SSC) and which may be used to satisfy the requirements for the professional title of A. Stat. from the SSC. Contact the Department of Mathematics and Statistics for more details. : MAT3172, MAT3175, MAT3379, MAT4371, MAT4374, MAT4374, MAT4375, MAT4376, MAT4377, MAT4378 MAT4380, MAT4381, MAT4382 | For more information regarding accreditation by the Statistical Society of Canada for the A. Stat. professional designation, please contact the Department of Mathematics and Statistics. | The following courses are recommended for the students interested in pursuing graduate studies in probability or statistics: MAT3120, MAT3121 and MAT3341. Other courses in probability and statistics which may be of interest include: MAT4170, MAT4171 and MAT4372. | Most 3000 and 4000 level courses are offered in alternating years with the French equivalent. | The course MAT3153 cannot be counted for credit if you have previously passed MAT4153. You may however take MAT3153 and then subsequently take MAT 4153, and count both for units. | Please note that all programs in the Faculty of Science require a minimum of 12 course units from the faculties of Arts, Education, Law, Social Sciences or the Telfer School of Management. | Co-operative education and the French Immersion stream are available when taken as part of an honours degree.

MINOR IN STATISTICS (30 UNITS)

	1ST YEAR (9 units)	2ND YEAR (9 units)	3RD YEAR (9 units)	4TH YEAR (3 units)
FALL	MAT1320 Calculus I or MAT1330 Calculus for the Life Sciences I MAT1341 Introduction to Linear Algebra or MAT1302 Mathematical Methods II (Fall or Winter)	MAT2342 Introduction to Applied Linear Algebra MAT2371 Introduction to Probability	9 course units from: (Fall or Winter) MAT3172 Foundations of Probability MAT3175 Introduction to Mathematical Statistics MAT3375 Regression Analysis MAT3378 Analysis of experimental designs MAT3379 Introduction to Time Series Analysis MAT4371 Applied Probability MAT4374 Modern Computational Statistics MAT4375 Multivariate Statistical Methods MAT4376 Topics in Statistics MAT4377 Topics in Applied Probability MAT4378 Categorical Data Analysis in Biostatistics MAT4379 Survey Sampling MAT4380 Advanced Regression MAT4381 Bayesian Inference MAT4382 Generalized Linear Models	3 optional course units in MAT at the 2000, 3000 or 4000 level or from among the following courses (Fall or Winter): BIO4158 Applied Biostatistics ECO4186 Applied Econometrics GEG4120 GIS and Numerical Spatial Analysis GEO4354 Quantitative Analysis in Geology
WINTER	MAT1322 Calculus II or MAT1332 Calculus for the Life Sciences II	MAT2375 Introduction to Statistics or MAT2379 Introduction to Biostatistics (Fall)		

Notes MAT2379: This course cannot count for units in the major or honours in mathematics or statistics. | Note: These courses in this list are accredited by the Statistical Society of Canada for the A. Stat. professional designation. Contact the Department of Mathematics and Statistics for more details. | MAT3172, MAT3175, MAT4186, MAT4120, MAT4354: These courses require prerequisites which are not part of the minor. | Most 3000 and 4000 level courses are offered in alternating years with the French equivalent.

MUSIC AND SCIENCE

Bachelor of Music (BMus)/Honours Bachelor of Science with Major (BSc), 5 years

Do you love music and science? Would you like to develop your musical abilities to their full potential while doing advanced studies in the sciences? You can, thanks to a bachelor's program offered jointly by the University of Ottawa's faculties of Arts, Science and Engineering. Acquire in-depth knowledge and pursue rigorous training in science and music, the first of its kind in Canada!

The Integrated Bachelor of Music and Science program was created for students who would like to be able to work in either field and are interested in developing their skills in both disciplines. This five-year integrated program leads to a degree in science (BSc) and in music (BMus) and opens the door to graduate studies. To be admitted to the program, students must meet the Bachelor of Science admission criteria and be accepted into the performance profile of the Bachelor of Music program, by successfully completing an instrument or voice audition demonstrating outstanding ability.

The science majors can be in one of the following disciplines: biochemistry, biology, chemistry, geology, mathematics, physics or statistics.

Admission to this program is through the Faculty of Arts.

LIFE SCIENCES

The Minor in Life Sciences gives students who carefully choose their optional courses most of the prerequisites to apply to schools of medicine, dentistry or pharmacy. However, you should carefully check the admission requirements of the medical school you are considering.

This minor cannot be combined with other life sciences programs (Biochemistry, Biology, Biomedical Science) as they already cover the material of the minor and more fully prepare students thinking of entering life science-based professions.

MINOR IN LIFE SCIENCES (30 UNITS)

	1ST YEAR (9 units)	2ND YEAR (9 units)	3RD YEAR (6 units)	4TH YEAR (6 units)
FALL	BIO1109 (register for this course if 4U Biology not completed) BIO1130 Introduction to Organismal Biology	CHM2120 Organic Chemistry II CHM2123 Laboratory of Organic Chemistry II	3 optional course units in BCH, BIO, BPS, CHM, EVS, MIC or PHA at the 3000 or 4000 level (Fall or Winter)	3 optional course units in BCH, BIO, BPS, CHM, EVS, MIC or PHA (Fall or Winter)
WINTER	BIO1140 Introduction to Cell Biology CHM1321 Organic Chemistry I	BCH2333 Introduction to Biochemistry	3 optional course units in BCH, BIO, BPS, CHM, EVS, MIC or PHA at the 3000 or 4000 level (Fall or Winter)	3 optional course units in BCH, BIO, BPS, CHM, EVS, MIC or PHA (Fall or Winter)

Notes BIO1109: beyond the requirements of the programs in science. | Students can register in 3000 or 4000 level courses having a laboratory component only with permission from the Faculty. | Students who wish to meet the entrance requirements for the Faculty of Medicine should choose BCH3120 or CHM1311 plus CHM2353 as part of their optional courses.

MICROPROGRAMS

SCIENCE COMMUNICATION

This microprogram consists of five courses (15 units) and will offer undergraduate students the opportunity to develop and refine their written, oral, and visual science communication skills. Scientists are increasingly expected to engage directly with the public to disseminate scientific information of value to society and to inform citizens, allowing them to make evidence-based decisions (COVID-19 is a great example).

SCIENCE EDUCATION

If you are interested in a career related to teaching or the design and delivery of educational programming, this microprogram will offer you the opportunity to acquire a strong foundation in Science Education. The courses can be counted as your elective courses at the 3000 and 4000 level in your undergraduate program. The combination of these courses is intended to develop your understanding and application of the scholarship of teaching and learning to your own scientific discipline.

SCIENCE ENTREPRENEURSHIP

The Science Entrepreneurship microprogram is a 15-unit (5 course) option that can be incorporated within your Honours BSc program. The option provides an introduction to business management, new venture creation, and entrepreneurship that will allow you to bring a new scientific idea to market. The option also includes a course on creativity and innovation, and the fourth year capstone course specifically deals with the particularities of bringing a scientific product to market.

SCIENCE POLICY

The University of Ottawa is privileged to be in the heart of the nation's capital where science policy is set. The Science Policy microprogram is a 9-unit (3 course) option that can be incorporated within your Honours BSc program. The option provides an introduction to public administration and public policy analysis. The option's fourth year capstone course specifically deals with the importance of science in evidence-based decision making and the setting of sound policy.

This is Science at uOttawa!

uOttawa

2024 PROGRAM GUIDE
Faculty of Science

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