Welcome to

SCIENCE

and Basic Medical Sciences
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Approximately 6,000 undergraduate students are engaged in Science and Basic Medical Science discovery at Western.

For Science (OUAC code: ES) Integrated Science (OUAC Code: ES)

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<tr>
<th>Mandatory</th>
<th>Plus Two Courses From:</th>
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<tbody>
<tr>
<td>English (ENG4U)</td>
<td>Advanced Functions (MHF4U)</td>
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<tr>
<td>Calculus and Vectors (MCV4U)</td>
<td>Biology (SBI4U)</td>
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<td>Chemistry (SCH4U)</td>
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<td>Computer and Information Science (ICS4U)</td>
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<td>Earth and Space Sciences (SES4U)</td>
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<td>Math and Data Management (MDM4U)</td>
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<td>Physics (SPH4U)</td>
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NOTE: First-year Biology and Chemistry courses require Grade 12 Biology (SBI4U) and Grade 12 Chemistry (SCH4U), respectively. First-year Biology and Chemistry courses are required for all modules offered by the Department of Biology and some modules offered by the Department of Chemistry and other Science departments.

Integrated Science students must complete Grade 12 Chemistry (SCH4U).

For Bachelor of Medical Sciences Program (OUAC code: ESM)

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<th>English (ENG4U)</th>
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<tr>
<td>Calculus and Vectors (MCV4U)</td>
<td>Chemistry (SCH4U)</td>
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NOTE: Although Western offers first-year physics courses that do not require high school physics as a prerequisite, it is strongly recommended that students complete Grade 12 Physics (SPH4U).

For more information: WesternuScience.ca/Admission
westerncalendar.uwo.ca

Once You Have Been Granted Admission to Western

Assistance with course selection is available during Summer Academic Orientation and is highly recommended. This service provides you the opportunity to discuss your courses, attend learning skills sessions and a student panel, take a tour of the campus and residences, set up a timetable and a Western email account, and register for your courses.

For more information: welcome.uwo.ca
A module is a collection of courses that define an area of concentration. The number of courses included in the module is defined by the amount of specialization in the topic. Western’s modular degree structure gives you the opportunity to combine various subjects from different departments and faculties. The specific courses included in each module are determined by the Department.

YOU HAVE THOUSANDS OF OPTIONS

Western’s modular system allows you to combine a Science module with a module in another Science or non-Science discipline to tailor your degree to fit your interests and aspirations. For example, if you are planning to complete a four-year Honors Bachelor Degree, you can pursue an Honors Specialization in Earth Sciences, combined with a Minor in Philosophy. An honors degree can also be constructed from two different Major modules, either both in Science or one in Science plus a non-Science. At Western, there are literally thousands of possible combinations of modules.

DUAL DEGREE PROGRAMS

There are cases where reaching a career goal requires more than one degree or certificate. Western offers several combined and concurrent programs so you can earn two degrees in less time, extend the scope of your marketable skills and cross traditional borders in your future careers.

Combined Degree Options

Science/Medical Sciences and Business (IVEY)

Concurrent Degree Options

Science/Medical Sciences and Engineering
Science and Nursing
Science and Music

USEFUL LINKS

Information for Parents: welcome.uwo.ca/parents/
Tuition: registrar.uwo.ca/student_finances/fees_refunds/fee_schedules.html
Residence: housing.uwo.ca/ (All first-year students are guaranteed a spot in residence)
Tours: uwo.ca/sci/undergraduate/future_students/campus_visits.html
Varsity Athletics: westernmustangs.ca/
Academic Counselling for Science and Basic Medical Science: uwo.ca/sci/counselling/
Biology, Health Sciences, Medical Sciences... What’s the Difference?

HEALTH SCIENCES

The Faculty of Health Sciences at Western University is distinct from the Faculty of Sciences and the Schulich School of Medicine & Dentistry. The Bachelor of Health Sciences (BHSc) program focuses on the interdisciplinary study of health and wellness in an ever-changing society, in addition to domestic and international health systems.

Graduates of the BHSc program have successfully established careers in a wide variety of health-related fields including:

- Physical, Occupational, Massage, Radiation, and Respiratory Therapy
- Community Public Health
- Public Sector Administration and Government Policy Development
- Biomedical Ethics
- Business (Wellness and Rehabilitation, Pharmaceuticals)

Graduate Studies (Health Administration, International Health Policy, Epidemiology, Clinical Anatomy, Global Health)

Non-profit sector (e.g., Heart and Stroke Foundation, Canadian Cancer Society)

Occupational Health & Safety and Clinical Trials Management

Education and Healthcare Law
At Western University, programs in Biology are offered by the Faculty of Science. Modules offered by the Department of Biology allow for the study of life at different levels of biological organisation—from how organisms interact with each other and the environment at the level of the ecosystem through to the study of individual genes in the laboratory.

Many graduates with Honors degrees in Biology go on to graduate studies (MSc and/or PhD) and professional schools. There is a broad range of employment opportunities for graduates with a biology background at all levels (BSc, MSc or PhD), including:

**Government:** agriculture, environment, fisheries, and health

**Business and Industry:** research, development and marketing in biotechnology, consulting and health care

**Teaching:** elementary, secondary or post-secondary institutions

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The Bachelor of Medical Sciences (BMSc) Program is offered jointly by the Faculty of Sciences and the Schulich School of Medicine & Dentistry. Modules offered by the Basic Medical Sciences explore the molecular, cellular and systematic organisation of the human body and the biological mechanisms it uses to adapt to environmental changes and the challenge of disease.

Many graduates with BMSc degrees in Basic Medical Sciences modules go on to professional schools and graduate studies (MSc and/or PhD). Other career/employment opportunities include:

**Law:** bioethics, patent development for medical products

**Business:** biotechnology, marketing, research and development, quality control

**Government Laboratories:** agriculture, marine and environmental sciences

**Industry:** Pharmaceuticals, biotechnology, biosafety, regulation and enforcement

**Teaching:** elementary, secondary or post-secondary institutions
Student Snapshots

Year 4, Honors Specialization, Astrophysics
President, Physics & Astronomy Students’ Association

My best research experience at Western: I worked in Dr. Sigut’s lab on Stellar Inclinations of Be Stars (massive stars). In this project, we used the morphology of the H\(\text{I}^+\) – line profiles to determine the stellar inclination angle from a single observation!

As a physicist, I like to understand why things happen. The goal of this project was to allow us to determine if stars in a cluster have correlated inclinations. From this, we can probe the initial conditions of the gas cloud from which they formed.

In retrospect: The fantastic professors here at Western were pivotal to my growth. Their mentorship and support have allowed me to grow into a physicist who is naturally curious about the mathematical framework of the Universe and actively apply my knowledge to solve real-world problems.

What’s next? I will be continuing my studies at Western University in the Accelerated Master’s of Physics program.

The Western Experience begins with our students. Bright, focused and driven, they represent a rich mosaic of cultures, interests, aspirations and achievements. Meet a few members of our outstanding student body.

Next year, one of these snapshots could be yours.

JORDAN
Year 5, Honors Specialization, Geology

Favourite high school subject: Visual Arts was my favourite subject in high school – I loved the ability to create and visual arts facilitated this in many dimensions.

Most interesting academic experience at Western: International field school to Colombia. This was an amazing academic and cultural experience. I got to see first hand, geologic settings that are world class and some breathtaking sites. We also traveled with a group from a local university and got to know them quite well, as we all shared a passion for geology.

For more information: WesternuScience.ca/Snapshots
PETER
Year 3, Honors Specialization, Neuroscience

Neuroscience Representative, Science Students’ Council; Emergency Medical Responder; 2.0 Team Leader for the Leadership & Academic Mentorship Program; Western Stem Cell Club; VP Events for Western Pre-Osteopathic Medicine Society

Favourite high school subject: World Issues was my favourite subject because I was fascinated by current events in the world. We were able to critically think about topics that were happening in real-time around us and I believe these skills were translatable to my University education.

Most interesting extra-curricular experience: As a member of the Student Emergency Response Team (SERT) on campus, I have acted as a first responder and patient advocate by providing medical care, mental health support and by connecting patients to advanced resources. The nature of medical emergencies has allowed me to become a better leader and problem solver since we continually face novel scenarios. This experience has also driven my curiosity and fueled my passion for science.

Leadership in the community: As a volunteer with the Learning Disabilities Association of London I helped run the first iteration of the Youth Upwards Program (YUP). YUP aims to help high school students diagnosed with learning disabilities become self-advocates in an academic and work-place environment by providing practical scenario experience and supplying the resources needed to excel.

In retrospect: Western has fostered my growth as a person by offering so much to its students. From the world-class faculty to the never-ending list of clubs to the largest school spirit, Western helps you become the best version of yourself!

CLAIRE
Year 4, Specialization, Chemistry
Chemistry Club President

Favourite high school subject: Biology was my favorite subject in high school. I loved the hands on approach to investigate organisms and it created a visualization of the system I was studying.

Leadership in the community: I was able to represent my peers’ views and vocalize student opinion to an active board of trustees. It was an amazing opportunity to develop as a public speaker and collaborate with so many exceptional students.

My best research experience at Western: I’ve always loved to innovate and to keep trying until something worked. This mindset translated perfectly into research here at Western. I spent the summer of 2017 working on the effect of chloride and sulfide on carbon steel in the Noel and Shoesmith Materials Degradation lab where I was surrounded by individuals who aim to solve problems and do so in a creative manner.

In retrospect: The teaching assistants and professors were exceptional and reached out to students to actively engage with them. I’m very grateful to Western for giving me the opportunity to expand my knowledge of Chemistry and for having supported me along the way.
ROSS
Year 3, Specialization, Computer Science

Favourite high school subject: Calculus – it was tough. I had to really put in the work, but those are the courses you get the most satisfaction from. No pain, no gain!

Teams and Associations: Being a member of the Western Track team and competing as a sprint hurdler taught me to manage my time effectively. Doing both computer science and track isn’t easy but if the passion is there you can make it happen.

In retrospect: The Department of Computer Science has been nothing but amazing. They seem to always be looking out for you when you need assistance whether it be academically or in personal matters.

What’s next? I hear most people say they want to travel right when they graduate. Personally I want to jump right into a job. Not because of the money, but because it would mean I can get started working on something I’m truly passionate about doing!

KIERSTIN
Year 2, Basic Medical Sciences
Intramural Soccer, Biology Undergraduate Society, general member

Favourite high school subject: My favourite subject in high school was World Issues. The course introduced me to the struggles people around the world face and put me in their shoes. It was both eye opening and humbling to see what is actually happening in the world and the role I can play in other people’s lives.

Leadership in the local community: I acted in the capacity of VP Communications for the Indigenous Students Association (ISA) - I am a First Nations student from northern Ontario and I was happy to attend many of the club’s events in first year. The ISA helped me to meet more amazing students, both indigenous and non-indigenous and really made Western feel more like home.

USEFUL LINKS

STUDENT GOVERNMENT:
uwo.ca/sci/undergraduate/student_experience/
undergraduate_student_council.html

CLUBS:
uwo.ca/campus_life/clubs_associations.html
Biology: westernbugs.com/
Chemistry: uwo.ca/chem/undergraduate/chemclub.htm
Applied Mathematics: apmaths.uwo.ca/~SAM/
Basic Medical Sciences: bmsawestern.com/
AMANDA

Year 5, Honors Specialization, Environmental Geology

VP Social, German Club and member of the Peer Guide Program, Western Foodies, Outdoors Club, Environmental Students’ Association, Outcrop Club

Favourite high school subject: I really enjoyed Visual Arts! As a student who focused a lot of her time in STEM subjects in preparation for university, it was always a nice break to use a different part of my brain and relax when making art.

My best research experience at Western: I received an undergraduate student research award (USRA) from NSERC for a summer research position with one of my favorite professors, Fred Longstaff. While it was a great learning opportunity, it was actually something else that made this experience incredibly special and that is when I received my first pay cheque in the mail. My mom told me how proud she was, and that was the first time, in a very long time, I genuinely felt it too.

In retrospect: I have been inspired by the amazing faculty at Western University, who have positively shaped my undergraduate academic career. From learning in state-of-the-art facilities to just simply enjoying the beauty of our campus, I know in just a few weeks I will be a very proud alumna!

What’s next? My undergraduate thesis was only the beginning of a larger study on nutrient loading in Southwestern Ontario river systems, and by extension, The Great Lakes. This summer, I plan to return to the Laboratory for Stable Isotope Science (LSIS) to continue and improve our already established research techniques through my third NSERC USRA. This fall, I intend on returning to the Department of Earth Sciences as a graduate student!

NICHOLAS

Year 2, Basic Medical Science, Honors Specialization in Integrated Science and Physics

Best experience at Western: Just being in the integrated science program. The entire atmosphere of first-year learning all the sciences at once from such a remarkable group of professors is incredible.

My best research experience at Western: With research, you must discover results for yourself, and through that process find the beauty and underlying pattern in the world around us. I loved fabricating monomer-based memory cards with Dr. Fanchini.
The university experience is far more than the sum of your lectures and textbooks. At Western Science, you’ll experience research, hone practical skills with labs and field courses and build communications skills through written reports and presentations. We call it high-impact learning. You’ll call it highly rewarding.

**CAPSTONE PROJECTS**
Both the BSc and BMSc programs offer a mentored research project in a world-class professor’s lab. This could be your hands-on introduction to our cutting-edge facilities, science research and may even result in your first technical publication.

**SCIENCE INTERNSHIP PROGRAM**
Gain significant work experience, ‘try-on’ a career, and make valuable contacts – all while earning a full salary. These 8 to 16-month paid positions in industry and government are open to Year 3 students.

**INTERNATIONAL LEARNING OPPORTUNITIES**
Interested in experiencing a new culture, language or exotic venue while developing your knowledge, skills and network? Western encourages global exploration through exchanges and study abroad programs with other universities, field schools, summer research, internships and volunteer opportunities.

**SUMMER RESEARCH**
Working in a lab over the summer is a great way to explore your research interests, develop technical skills, expand your network and be mentored by world-class researchers and their graduate students. The NSERC Undergraduate Summer Research Award, Western programs, and individual researcher’s grants combine to offer a wide variety of opportunities. You may even end up authoring your first professional research paper!

For more information: WesternuScience.ca/High_Impact
AUTHENTIC LEARNING CONTEXTS

➢ Take courses which simulate the development arm of software companies and game studios.

➢ Develop an innovative business plan to commercialize novel science and emerging technologies by competing in the Proteus competition.

➢ Receive course credit while attending the National Undergraduate Capstone Open Source Project

➢ Apply academic knowledge to exciting projects on the ground in national and international locales; study forest ecology in the Adirondacks, desert ecology in the American southwest, tropical marine environments in Belize, and craters in the Sultanate of Oman.

In the summer of my third year, I was awarded a fellowship under AAPM, which allowed me to contribute to proton therapy research at the Massachusetts General Hospital. In addition to providing me with the opportunity to work with brilliant scientists from all over the world, this experience gave me freedom to independently explore a different environment and culture. This fellowship opened my eyes to a world of possibilities as well as the value of international collaboration.

Kimberley
Medical Biophysics Alumni
Western Science

PROGRAMS
Life Sciences
Biodiversity & Conservation

A recent study puts the total number of species on Earth at close to 9 million. However, what is more surprising is that scientists estimate that over 80% of those species have yet to be discovered! We are at a time when there is a strong need for better scientific understanding of global biological diversity, the threats to its existence, and development and implementation of methods for its conservation. Addressing these issues requires individuals with a solid grounding in systematics, genetics, ecology, and field biology, which provide a foundation for advanced courses and hands-on experiences in conservation and restoration.

Genetics

The most important alphabet on Earth is its smallest — the four letter code of DNA. How hereditary information is conveyed using such a small code began to be understood by studying organisms in which something was wrong (mutants). Today this traditional approach is complemented by molecular genetics, which takes advantage of a wealth of DNA sequence information as well as technologies that allows one to easily disrupt and replace specific genes. As a student, you can take a range of courses focused on gene structure, function and regulation that are taught using a range of animal, plant and microbial systems. Courses in genetic engineering, developmental genetics, behavioral genetics, and evolutionary genetics convey the importance of the smallest alphabet on all aspects of life.

Animal Behavior

Scientists, as well as philosophers, have always asked why animals and people behave as they do. Behaviour involves a wide range of traits from animal communication, foraging, sexual behaviour, social organization, and cognition. Research into behavior ranges from analyses involving hormone levels and gene expression through to addressing broad questions such as the functions that behaviour serves, how behaviour develops and how specific behaviours have evolved. This area of study draws on expertise from both the Department of Biology as well as the Department of Psychology.

100% of Biology students get hands-on lab experience in second-year.
As an undergraduate student in biology, you will have the opportunity to carry out a research project in an exotic location and get credit for it. Examples of recent offerings include: Rainforests and Reef Biology in Costa Rica; Tropical Marine Biology in Belize; Forest Ecology in the Adirondacks; Field Ornithology in Virginia and Tropical Biodiversity in Ecuador.
Basic Medical Sciences

...EN ROUTE TO THE BACHELOR OF MEDICAL SCIENCES (BMSc) PROGRAM

You are able to perform novel research in Year 4 under the supervision of a faculty member in 21 different discipline-specific Honors Specialization modules.
The Basic Medical Sciences look at the molecular, cellular and systems organization of the human body and the biological mechanisms it uses to adapt to environmental changes and disease. The Bachelor of Medical Sciences Program that leads to the four-year BMSc degree, is offered jointly by the Faculty of Science and the Schulich School of Medicine & Dentistry. It is designed for students interested in advanced study of one or more of the basic medical sciences. This joint program focuses on the application of science to the diagnosis, prevention, and treatment of human disease.

**BIOCHEMISTRY**

Personalized medicine informed by genome analysis. Designer organisms that produce valuable medications or clean up environmental toxins. Rational drug discovery to correct specific cellular malfunctions. Crucial to all such advances in biotechnology is an understanding of how life works at the molecular level. Join us in Biochemistry at Western as we explore the intricate interplay among the molecules that sustain life.

**EPIDEMIOLOGY AND BIOSTATISTICS**

Are you interested in understanding why some people get sick and others do not? Consider studying Epidemiology at Western! Epidemiologists investigate why rates of disease vary by person, place and time. As such, epidemiology is the science which underlies public health practice. You will learn how to identify causes of disease, and how to evaluate new strategies for preventing people from becoming ill and for treating people in whom disease develops.

**INTERDISCIPLINARY MEDICAL SCIENCES**

Interdisciplinary research is an emerging field in the medical sciences! Come join the interdisciplinary medical sciences module, where we identify and study a disease that is relevant to the health and well-being of Canadians. We emphasize the value of studying a disease from multiple disciplines to advance medical science research.

**MEDICAL BIOPHYSICS**

Are you interested in both biology and physics, and in using these to improve human health? Then Medical Biophysics is the program for you! Through small highly interactive classes and faculty-supervised research projects, you will learn to apply mathematics, biology, chemistry and physics to areas such as medical imaging (CT, MRI, PET, US), cancer radiation therapy, joint and tissue biomechanics, and cardiovascular and lung disease.

**MEDICAL BIOLOGY**

Medical Cell Biology is the study of the cell, the basic building block of life. In Medical Cell Biology, you will learn how cells work together to form tissues, organs and the human body. You will also learn what happens when cells malfunction leading to diseases such as cancer.

**MEDICAL HEALTH INFORMATICS**

Medical Health Informatics is more simply – the study of computers and information technologies in the health system. How can we use technology to improve diagnosis of disease through digital imaging, to treat disease through innovative mobile health apps, to prevent disease through calculating risk factors in huge data sets, or monitor and record health and disease within an electronic health record? Combine your interest in studying the human body with skills to develop, understand and evaluate innovative technology.

As a Medical Sciences 1 and 2 student, you are registered in the Faculty of Science and develop a foundation in:

- Biology
- Chemistry
- Physics
- Genetics
- Cell biology
- Math and Statistics

In Year 3, you will transition to courses offered by the Basic Medical Science departments in the Schulich School of Medicine & Dentistry to learn and understand the interrelationship between the basic and clinical medical sciences and to explore one or more of these disciplines in depth.
MICROBIOLOGY AND IMMUNOLOGY
How do humans survive when we are constantly exposed to microbes outside and inside our body? Microbiology & Immunology teaches you how our immune system responds to microbial infections and tumor cells; how some microbes cause global infectious diseases and epidemics while others benefit our health, industry and the environment; why we get vaccines, autoimmune diseases, allergies, and more.

NEUROSCIENCE
The human brain is the part of the body that makes each of us unique. It holds our thoughts, experiences and emotions and allows us to adapt to our changing world. In Neuroscience, you will learn the mysteries of the brain and how brain injury can lead to disorders such as Alzheimer’s, Autism and Depression.

ONE HEALTH
Did you know that more than 60% of all known human diseases are passed from other species? Degradation of our environment also creates favorable settings for the emergence of new diseases and the expansion of existing ones. One Health is an exciting new interdisciplinary field that aims to understand how humans, the environment, and animals are interconnected and interdependent for health. One Health links many different types of scientists and scientific approaches – all the way from basic and environmental science to biomedical science to population health to policy and governance – with the goal of improving our health.

PATHOLOGY
Pathology is the study of disease. Understanding how and why a disease develops is the foundation of Pathology. Cancer, asthma, and heart attacks are just some of many disease processes studied in pathology. This multidisciplinary field draws from basic sciences of anatomy, cell biology, genetics, immunology, and physiology to study the cause, origin and nature of diseases. Deciphering the mechanism of diseases have led to major advances in medical approaches, such as vaccines against infectious diseases, organ transplantation, safe blood transfusion, genetics and forensics. Come learn about cutting-edge Pathology research.

PHYSIOLOGY AND PHARMACOLOGY
Want to learn about how the human body works and how to treat diseases with drugs? If so, study physiology and pharmacology at Western! Explore how your body works and how to treat it when things go wrong by learning about the body’s main organs…brain, heart, kidney, liver and more.

RESEARCH
In addition to the Year 4 research project, you can undertake other opportunities to acquire state of the art research skills. Enhance your abilities and discover the value of a career in biomedical research through the Biochemistry Undergraduate Summer Research Program after Year 3. If you are interested in experiencing the culture of a developing nation while broadening your research skills, the Department of Microbiology and Immunology also offers unique research experiences on the African continent as well as fellowships for second- and third-year students to perform independent research over the summer.
Computer and Mathematical Sciences
Computer Science

INFORMATION SYSTEMS
Are you passionate about business but need an edge in a highly competitive marketplace? Do you want to learn how technology can be applied to solve critical business problems and create exciting new opportunities? Information Systems is for you! This program allows you to explore computing in a practical setting, preparing you to be the leader who knows how to make technology work for you and your organization, or the technical expert who understands the world of business. This is a win-win degree!

MEDICAL HEALTH INFORMATICS
The cure is out there – we just have to find it! Using computing to collect, store and analyze medical data is rapidly accelerating the way we solve medical mysteries. The medical professionals of tomorrow must have the right tools and expertise to help them manage the overwhelming volume of data. A background in Computer Science, along with an understanding of medical data, unlocks the potential to impact public health and influence the future of medicine!

GAME DEVELOPMENT
Games are serious business. In fact, video games generate more revenue each year than music, film, television, and books. Making a successful video game is not child’s play either. Computing, naturally, plays a big role from programming, to graphics, to audio, to physical simulation, to online support, and more. Computer Science at Western has what it takes to prepare you for this exciting, challenging, and creative field, and has been ranked in the top 50 universities in the world to study game development for three years running – something you won’t find anywhere else in Canada!
Future game developers benefit from courses set up as game development studios. They take on leadership roles in simulated consultant firms, take on project management responsibilities and assume ownership of technical deliverables.

Computer Science grants degrees that are accredited by the Computer Science Accreditation Council and the Canadian Information Processing Society, facilitating subsequent professional certification as an Information Systems Professional or an Information Technology Certified Professional.

WHAT YOU’LL LEARN

- Design and build software
- Solve computing problems
  - Storing information in databases
  - Sending data over networks
  - New solutions to cybersecurity
- Address challenges in:
  - Big Data
  - Game Development
  - Social and Mobile Computing
  - Medical Imaging
  - Bioinformatics

100% of Computer Science students are employed within 24 months post-graduation.
The School of Mathematical & Statistical Sciences
The School of Mathematical and Statistical Sciences represents the collaborative efforts of the Departments of Applied Mathematics, Mathematics and Statistical and Actuarial Sciences. Each of these departments offers training in the mathematical and statistical science that prepare our students for pivotal roles in industry, government and academia.

FINANCIAL MODELLING
Are you great at seeing patterns, solving problems and strategizing? Studying financial modelling may be right for you. At Western, Financial Modelling will teach you to forecast, quantify, hedge, and manage financial risk like rising interest rates when it’s time to renew a home mortgage, a stock market crash requiring a delayed retirement or a dip in share value impacting acquisition negotiations.

ACTUARIAL SCIENCE
Actuaries are the brains of insurance companies, which create and manage financial products designed to mitigate the impact of life challenges including premature death, major illness, disability, car crash, or property damage due to wind, fire, or flood. At Western, we train you to become a sophisticated business professional who assesses the probability and impact of these to design situations which mitigate personal challenges.

DATA SCIENCE
There is more data being produced in all facets of society than ever before. If you are interested in learning how to manage, visualize, model and transform data into solutions to existing challenges or into new and commercializable products, data science is the learning path for you.

WHAT YOU’LL LEARN
➜ Develop mathematical and stochastic models for phenomena occurring in business, engineering, medicine and government using modern, computer-based, statistical methods
➜ Apply advanced mathematical, computational and statistical techniques to problems arising in modern financial markets
➜ Apply existing and develop new models and methods used in the management of risk associated with adverse life events like premature death and disability
➜ Game and Number Theory
➜ Collect, analyze and interpret data
➜ Computational Materials Science

Western is accredited by the Statistical Society of Canada and students completing a degree in Statistics may receive accreditation as an Associate Statistician.

100% of our students have smaller and more specialized classes in their third and fourth year of our programs.

Actuarial Science scholarships are awarded yearly that provide for an aggregate payout of up to $45,000 annually to undergraduate students.
Four annual TD Women in Data Analytics Bursaries of $5,000 are awarded to encourage greater gender equity and provide meaningful financial support to women entering this discipline.

SCIENTIFIC COMPUTING AND NUMERICAL METHODS
Computation is now fundamental to scientific discovery and engineering design alike. The Boeing 777 Dreamliner, for instance, was conceived mostly on a computer, complete with detailed calculations of aerodynamic and control properties. Drugs can also be designed on computers as can modern materials. To become an expert in the algorithms behind these innovations, take our Scientific Computing and Numerical Methods program.

APPLIED MATHEMATICS
Mathematics is the language of science. The flow of air over a wing, the way birds flock and the mechanism by which organisms evolve all follow mathematical laws. If you want to contribute to the next generation of scientific breakthroughs, then modelling scientific phenomena with math and solving the resulting equations with our Applied Math community may be your path to success.

MATHEMATICS
Often known as ‘The Queen of the Sciences’, Mathematics is the discipline of pure abstract thought. A degree in Mathematics allows you to grapple with questions like how can space be curved or what is the best way to pack 26-dimensional spheres together? A profound background in mathematics is fundamental to the practical field of cryptography and provides deep training for any profession in which logical thinking is at a premium.

TOP 20  Modelling against over 2,000 teams worldwide Western is consistently in the top 20 and twice have been world champions of the COMAP Mathematical Contest.

Actuarial Science, Data Science, Financial Modeling and Statistics degrees lead to jobs ranked within the TOP 5% of the best careers according to Forbes and Career Cast.
Physical Sciences
Chemistry

SYNTHESIS
Do you like baking? Mixing ingredients together to get new substances? Trade in your spoons, measuring cups and pots for spatulas, graduated cylinders and flasks and experience baking, aka 'synthesis' at the molecular level! Like baking, chemical synthesis requires creativity, devising new strategies for making exciting new molecules. But no tasting here; use a variety of wavelengths of light from X-rays to radiowaves which can interact with your newly formed substances and give you clues about what you have made. If you like solving puzzles, you will enjoy piecing together the information provided by interactions of light with matter to determine the structures of your new creations!

MATERIALS
Advanced materials, like carbon nanotubes have revolutionized the hockey stick. New polymers have been designed to transport life-saving medication to the heart of a tumour and then degrade! These person-made materials have to be made, characterized and their properties understood before they can be applied. Explore the chemistry of materials and be part of the development of innovative substances for sports, medicine, alternative energy and the environment.

BIOCHEMISTRY
What is a double-helix? Why am I allergic to peanuts? What is cholesterol and why is it only in animals? Why can’t I eat a tree? Understanding the chemistry of living systems helps us to understand life, what keeps us alive and what keeps us healthy. If you are interested in devising ways to solve problems when the chemistry goes wrong, as in cancer and other related diseases and chronic health conditions, consider biochemistry at Western.

WHAT YOU’LL LEARN
- Tools and techniques of chemistry
- Numeracy, deductive and inductive skills
- New reaction pathways and compounds
- Interpretation of experimental results

Our first-year labs are flooded with natural light, offer large workstations designed to support learning collaborations and are fitted with computer-controlled modular equipment to simulate an authentic lab environment found in government and industry.

CAREERS
- Quality Control Technician
- Technical Writer
- Production Chemist
- Pharmacologist
- Professional School
- Government (Science Policy)
- GOVERNMENT
- PROFESSIONAL SCHOOL
- PRODUCTION CHEMIST
- PHARMACOLOGIST
- TECHNICAL WRITER
- QUALITY CONTROL TECHNICIAN

TOOLS AND TECHNIQUES
- Numeracy
- Deductive and inductive skills
- New reaction pathways and compounds
- Interpretation of experimental results
First-year Chemistry students are paired with senior students in the fall term to engage in *Explore Chemistry* activities like meeting industry guest speakers and shadowing a fourth-year student engaged in their honors thesis research in the lab.

100% of Chemistry students in a 4-year degree program will do hands-on research with a faculty member’s research group.
Physics & Astronomy

WHAT YOU'LL LEARN

- Tools and techniques of modern high technology
- Computer simulation
- Experimental design
- Data analysis
- Logical reasoning
- Mathematics

100% of Physics & Astronomy students get research experience with a faculty member.
ASTROPHYSICS

Are you interested in understanding the universe and our place in it? Consider studying astrophysics at Western! Through the interaction of light and matter, you can access the universe through observatories around the world and in space. Astrophysicists at Western will help you explore black holes, exoplanets, meteors, the atmospheres of Earth and other planets, the dust and gas between the stars, and the evolution of galaxies over cosmic time.

MEDICAL PHYSICS

Do you really love physics and you’re interested in contributing to modern medicine? Medical Physics students at Western have the opportunity to develop tools for cancer treatments, participate in the development of the next generation of magnetic resonance imaging scanners, work on blood flow imaging to diagnose heart disease, or analyze complex brain maps. Join the team of medical physicists at Western to investigate these topics and more.

PHYSICS OF MATERIALS

Do you wonder how our technology works? Physics connects the microscopic rules of quantum mechanics to the macroscopic properties of modern materials. Participate in developing new types of solar cells, studying the interface between cells and matrix material, or building lasers based on quantum dots. Our experimental physicists are looking for students to contribute to these and other projects.

Students in all years of physics and astronomy collaborate through a seminar course to learn solid communications and scientific translation skills.

100% of our students have small, specialized classes in third and fourth year.

Professional Programs

Including:
- Medicine, Engineering
- Weather Forecasting and Climate Prediction

Careers

- Academic and Industrial Scientist
- Radiation Oncologist
- Medical Imaging Physicist
- Entrepreneur Tech Start-up
- Financial Analyst
- University/College Professor
- Science Educator
- Government Scientists
- Data Scientist
Earth Sciences

The tectonic mechanisms that create earthquakes and volcanic eruptions

The processes that occur within the planet, that shape its surface, and that control its atmosphere

The origin, occurrence, extraction and conservation of Earth’s natural resources, including minerals, fossil fuels, soils and water

The role of the Earth within the Solar System and the history of life on Earth

More than 90% of students will receive research experience with a faculty member through their fourth-year thesis project.

100% of Earth Science students have small, specialized classes in third or fourth year.
ENVIROMENTAL GEOSCIENCE

Human activities affect, and are affected by, complex interactions of Earth: the biosphere, atmosphere, hydrosphere and Earth materials. Are you interested in developing sustainable solutions to environmental problems, from local water/air/soil pollution to global climate change, or dealing with natural hazards, from local civil engineering problems to large-scale catastrophes? Then you will need the solid understanding of the dynamic relationships between natural processes on and within our planet that the Environmental Geoscience at Western provides on your path to becoming a professional geoscientist!

GEOLOGY

Geology studies the processes that shape the Earth’s surface features, interior structure and composition. At Western, multidisciplinary skills are developed in field, laboratory, theory, and computation. This broad approach will give you the skills to meet emerging challenges in the responsible development of new resources and mitigation of natural hazards like earthquakes, volcanoes, and landslides.

GEOPHYSICS

Explore how Earth’s magnetic field protects us from being sautéed by the Sun’s harmful radiation. Consider how birds use the magnetic field to navigate during migration. Learn about why North America is moving away from Europe at 5 cm per year. Dig into the resources found underground to produce innovative products like cell phones. Geophysics at Western offers a great opportunity to study and unlock the secrets of the interior of the Earth and other planets and prepare you for an exciting future in exploration.

PLANETARY SCIENCE

Are you interested in exploring other worlds? Consider planetary science as your path to finding out how new and ongoing space missions to planets, moons and asteroids are revolutionizing our view of the formation and evolution of the solar system. Learn how the Earth became a habitable world, and why other planets took radically different pathways. Explore worlds with ice mountains, hydrocarbon lakes, and subterranean oceans. Studying planetary science at Western will give you a new way of looking at the universe.
Environmental Sciences

What Is Environmental Science at Western?

Environmental issues ranging from biodiversity loss, access to safe and clean water, energy, renewable resources, to ecosystem health, natural disasters, and sustainable business practices are explored in the Environmental Science program at Western.

Our students learn to communicate environmental science across disciplines and to apply knowledge from these different fields to develop solutions to real-world issues. Building on a solid core of science – including content in biology, chemistry, mathematics, earth sciences, geographic information science and physical geography – Environmental Science students have the added benefit of access to training in other disciplines ranging from anthropology, business, and economics, to First Nations Studies, Philosophy, political science, human geography and sociology.

100% of our students have the opportunity to participate in a paid 8-16 month Science Internship with government or industry in environmental policy, management and science.

WHAT YOU’LL LEARN

- Process environmental issues
- Biodiversity loss
- Access to safe and clean water
- Energy
- Renewable resources
- Ecosystem health
- Natural disasters
- Sustainable business practices
Students with a two-year Environmental Technician or three-year Environmental Technology Advanced Diploma from most Ontario colleges can receive advanced standing credits toward an Environmental Science degree.

Our students conduct their research projects in state of the art facilities like the Biotron for Climate Change Research.
Integrated Sciences

100% of WISc students undertake a cross-disciplinary research project.
A maximum of 60 participants per cohort means instructors can focus on the individual growth of students while encouraging collaborative and peer learning.

Whether it’s climate change, renewable energy or antibiotic resistance, today’s most pressing problems are fundamentally interdisciplinary. They require you to have both discipline-specific expertise and possess a broader perspective allowing you to readily engage with individuals from other disciplines to tackle the problem. Helping you get there is the focus of Western’s Integrated Science program (WISc). Using a unique small classroom environment, you will learn the fundamentals of a broad range of sciences. Exploring how they can be used together to address a range of problems is what makes this program extraordinary. If you are interested in learning, for example, how computer science is used to better understand protein evolution or how chemistry adds to our understanding of the geology of a distant planet, and you enjoy hands-on experimentation in a small team environment, then Integrated Science is the right program for you.

Dedicated collaborative student workspace with 24/7 availability.

Hands-on learning in a high-tech science facility designed exclusively for integrated science.
There are four possible modules of study which may be entered after First-Year:

- Honors Specialization (9.0 or more specified courses)
- Specialization (9.0 or more specified courses)
- Major (6.0 - 7.0 specified courses)
- Minor (4.0 - 5.0 specified courses)

For more information: WesternuScience.ca/Modules

A module is a collection of courses that defines an area of study. The number of courses included in the module is defined by the amount of specialization in the topic.

INTEGRATED SCIENCE

<table>
<thead>
<tr>
<th>Module</th>
<th>Honors Specialization</th>
<th>Specialization</th>
<th>Major</th>
<th>Minor</th>
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</thead>
<tbody>
<tr>
<td>Integrated Science with Biology</td>
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<td>Integrated Science with Chemistry</td>
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<td>Integrated Science with Computer Science</td>
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<tr>
<td>Integrated Science with Earth Sciences</td>
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</table>

Modules can be combined in the three different degree-types:

**Honors Bachelor Degree** (4 Years/20 courses)
- Honors Specialization
- Honors Specialization-Major
- Honors Specialization-Minor
- Major-Major

**Bachelor Degree** (4 Years/20 courses)
- Specialization
- Specialization-Major
- Specialization-Minor
- Major-Major
- Major
- Major-Minor
- Major-Minor-Minor

**Bachelor Degree** (3 Years/15 courses)
- Major
- Major-Minor
- Minor-Minor
## Basic Medical Sciences

<table>
<thead>
<tr>
<th>Module</th>
<th>Honors Specialization</th>
<th>Specialization</th>
<th>Major</th>
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</thead>
<tbody>
<tr>
<td>Biochemistry</td>
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<tr>
<td>Biochemistry and Cancer Biology</td>
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<td>Biochemistry and Cell Biology</td>
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<tr>
<td>Biochemistry and Cancer Biology</td>
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<tr>
<td>Biochemistry of Infection and Immunity</td>
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<tr>
<td>Biochemistry and Pathology of Human Disease</td>
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<tr>
<td>Chemical Biology</td>
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<tr>
<td>Computational Biochemistry</td>
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<tr>
<td>Epidemiology and Biostatistics</td>
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<tr>
<td>Interdisciplinary Medical Sciences</td>
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<tr>
<td>Medical Biophysics</td>
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<tr>
<td>Medical Biophysics (Clinical Physics Concentration)</td>
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<td>Medical Biophysics (Medical Science Concentration)</td>
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<td>Medical Biophysics and Biochemistry</td>
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<tr>
<td>Medical Cell Biology</td>
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<tr>
<td>Medical Health Informatics</td>
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<tr>
<td>Microbiology and Immunology</td>
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</tbody>
</table>

NB. The Major in Medical Sciences cannot be completed in combination with any of the following Majors: Biochemistry, Medical Biophysics, Medical Cell Biology, Microbiology and Immunology, Pharmacology.

## Modules Leading to a BSc Degree

<table>
<thead>
<tr>
<th>Module</th>
<th>Honors Specialization</th>
<th>Specialization</th>
<th>Major</th>
<th>Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry and Chemistry</td>
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<tr>
<td>Genetics and Biochemistry</td>
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<tr>
<td>Medical and Biophysics (Biological Concentration)</td>
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<tr>
<td>Medical Biophysics (Physical Science Concentration)</td>
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<tr>
<td>Neuroscience</td>
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<tr>
<td>Medical Sciences</td>
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</table>

## Biology

<table>
<thead>
<tr>
<th>Module</th>
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<th>Specialization</th>
<th>Major</th>
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</thead>
<tbody>
<tr>
<td>Biology</td>
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<tr>
<td>Animal Behaviour</td>
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<tr>
<td>Biodiversity and Conservation</td>
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<td>Ecosystem Health</td>
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<tr>
<td>Genetics</td>
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<tr>
<td>Genetics and Biochemistry</td>
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</table>
### Computer Science

<table>
<thead>
<tr>
<th>Module</th>
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</thead>
<tbody>
<tr>
<td>Computer Science ¹</td>
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<tr>
<td>Bioinformatics</td>
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<tr>
<td>Information Systems</td>
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<tr>
<td>Applications of Computer Science</td>
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<tr>
<td>Software Engineering ², ³</td>
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<tr>
<td>Computer Algebra ⁴</td>
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<tr>
<td>Computer Hardware Design</td>
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<tr>
<td>Theoretical Computer Science ⁴</td>
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<tr>
<td>Game Development ⁵</td>
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<tr>
<td>High-Performance Computing</td>
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</table>

¹ The Honors Specialization and Specialization lead to accredited degrees by the Computer Science Accreditation Council.
² Can only be completed in combination with an Honors Specialization or Specialization in Computer Science.
³ Leads to accredited degrees by the Computer Science Accreditation Council.
⁴ Can only be completed in combination with an Honors Specialization in Computer Science.
⁵ Can only be completed in combination with an Honors Specialization, Specialization, or Major in Computer Science.

### Applied Mathematics

<table>
<thead>
<tr>
<th>Module</th>
<th>Honors Specialization</th>
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<tbody>
<tr>
<td>Applied Mathematics</td>
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<tr>
<td>Applied Mathematical Methods</td>
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<tr>
<td>Mathematical Sciences ³</td>
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<tr>
<td>Mathematical and Numerical Methods</td>
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<tr>
<td>Scientific Computing and Numerical Methods</td>
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<tr>
<td>Theoretical Physics ¹</td>
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</tbody>
</table>

¹ Can only be completed in combination with a Minor or Major in Applied Mathematics.

### Mathematics

<table>
<thead>
<tr>
<th>Module</th>
<th>Honors Specialization</th>
<th>Specialization</th>
<th>Major</th>
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</thead>
<tbody>
<tr>
<td>Mathematics</td>
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<tr>
<td>Mathematics in Society</td>
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### Statistical and Actuarial Sciences

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Actuarial Science</td>
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<tr>
<td>Statistics</td>
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<tr>
<td>Applied Statistics</td>
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<td>Financial Modelling</td>
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<tr>
<td>Data Science</td>
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</table>
## PHYSICAL SCIENCES

### Chemistry

<table>
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<tr>
<th>Module</th>
<th>Honors Specialization</th>
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<th>Major</th>
<th>Minor</th>
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<tbody>
<tr>
<td>Chemistry</td>
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<tr>
<td>Advanced Chemistry</td>
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<tr>
<td>Biochemistry and Chemistry</td>
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</table>

1. Can only be completed in combination with an Honors Specialization in Chemistry, a Specialization in Chemistry or an Honors Specialization in Biochemistry and Chemistry.

### Physics and Astronomy

<table>
<thead>
<tr>
<th>Module</th>
<th>Honors Specialization</th>
<th>Specialization</th>
<th>Major</th>
<th>Minor</th>
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</thead>
<tbody>
<tr>
<td>Physics</td>
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<tr>
<td>Astrophysics</td>
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<tr>
<td>Advanced Physics</td>
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<tr>
<td>Conceptual Astronomy</td>
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<td>Materials Science</td>
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<td>Medical Physics</td>
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<tr>
<td>Physics of Materials</td>
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</table>

1. May only be completed in combination with an Honors Specialization in Physics, Astrophysics or Medical Physics.

2. May only be completed in combination with an Honors Specialization or Specialization in Physics.

## SUSTAINABILITY SCIENCES

### Earth Sciences

<table>
<thead>
<tr>
<th>Module</th>
<th>Honors Specialization</th>
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<th>Major</th>
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</thead>
<tbody>
<tr>
<td>Geology</td>
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<tr>
<td>Environmental Geoscience</td>
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<tr>
<td>Geology and Biology</td>
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<tr>
<td>Geophysics</td>
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<tr>
<td>Planetary Science and Space Exploration</td>
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### Earth Science Programs for Professional Registration

1. These programs fulfill requirements for professional registration as set by the Association of Professional Geoscientists of Ontario (APGO) and the Canadian Council of Professional Geoscientists (CCPG).

## Environmental Science

<table>
<thead>
<tr>
<th>Module</th>
<th>Honors Specialization</th>
<th>Specialization</th>
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</thead>
<tbody>
<tr>
<td>Environmental Science</td>
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