FACULTY OF SCIENCE

COMPUTATIONAL PHYSICS

From the transistor to the internet to the quantum computer, physicists have always played a leading role in the development of new computing hardware and methods. Computational physics at UWinnipeg combines computer science, physics, artificial intelligence, data science, and applied mathematics to solve complex problems.

In the computational physics stream, you will learn all about the fundamental laws of nature, while developing real world skills in numerical methods and coding, as well as data handling and visualization. You will also learn about leading edge techniques such as artificial intelligence (AI), quantum computing, and machine learning.

Professors in the physics department conduct research in subatomic physics, medical physics, theoretical physics, and applications to developing fields of technology like digital agriculture. All of these research areas make use of computing to solve problems, and many students participate in research using computational resources under the direction of faculty. As with the main physics program, students may find paid summer employment with the various research groups. This program leads to a **Bachelor of Science degree (4-year Honours)**, which provides excellent preparation for entry into graduate programs in computer science or physics or into industry where analytical and computing skills are in demand. ***Also, please see other related fact sheets: "Physics," "Pre-Engineering," and "Medical Physics."***

SAMPLE CAREERS

Graduates apply their analytical and computing skills in many fields, including engineering, finance, climate modelling, agriculture, space science, astronomy, computer gaming and animation. Data scientists, for example, are in high demand in all of the social, life, and natural sciences, as well as the government, health, and insurance sectors. Graduates are hired by places such as: JCA Technologies, Farmers Edge, Pluto Ventures, Ubisoft, Nvidia, Blue Origin, Boeing, 3M, Price Industries, and Cubresa Inc, in roles ranging from computational fluid dynamics (CFD) analyst, to aerospace engineer, to data scientist. Many of our students continue research activities in some of the top graduate schools in North America, such as Cornell, the University of British Columbia, McGill, Waterloo, McMaster, and the University of Toronto.

SAMPLE COURSES

Scientific Computing with Python is an introduction to the Python programming language. After basic introductions to the programming language, students will learn about data visualization, and apply programming to a variety of scientific problems.

Mathematical Physics I and II provide you with all the mathematical tools you need to succeed in your upper-level physics courses. They also provide the mathematical basis for understanding many computer algorithms and numerical methods.

Physical Computing: Interacting With the Real World introduces computing systems that interact with the physical world via software and hardware development. Students are introduced to software development for microcontrollers or single board computers, with a focus on interfacing to sensors and serial communication and use this knowledge to build a "seeing" robot.

MORE SAMPLE COURSES

- Thermal and Statistical Physics
- Electricity & Magnetism
- Quantum Mechanics
- Subatomic Physics
- General Relativity
- Numeric and Symbolic Computing

SAMPLE FIRST YEAR

PHYS-1101(6) Foundations of Physics
PHYS-2102(3) Scientific Computing OR PHYS-2112(3) Scientific Computing with Python
MATH-1103(3)/1104(3) Introduction to Calculus I and II
RHET-1103(3) Academic Writing: Science, or any other section of Academic Writing (if required)
ACS-1903(3)/1904(3) Programming Fundamentals I and II
6 credit hours Humanities

NOTE: *This sample first year is representative of the courses you may take. For many of our programs, you may choose another set of courses and still be well on your way to a degree. Also, for most programs you do not have to take 30 credit hours (five full courses) in your first year.*

"The math and problem-solving skills I learned while studying physics made learning about computer science a natural path to follow. Using this combined skill set, I was able to do exciting research with professors from both Physics and Applied Computer Science departments at UWinnipeg. The level of mentorship I received meant I built unique in-demand skills while also gaining practical experience."

- Michael Honke (BSc Physics), Software Developer at Ziva Dynamics | Physics Simulation and Graphics Developer

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HOW TO APPLY

For details on application requirements and deadlines, and to apply online, please visit: **uwinnipeg.ca/apply**

For more information contact a student recruitment officer at welcome@uwinnipeg.ca or 204.786.9844.

In any case where the University's Academic Calendar and this fact sheet differ, the current Calendar takes precedence.

CONTACT US

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