

# COMPUTATIONAL MATHEMATICS

CO-OP OR REGULAR

**66** cross-listed professors from Computer Science and Math

**#1** in Canada for partnerships with employers

**96.6%** of grads are employed within 2 years

## *Study the intersection of mathematics and computer science*

Solving industrial-sized problems was next to impossible until recently. Now the power of computers can be harnessed to generate and run mathematical models, producing data that can be mined for quantitative solutions. Computational Mathematics is a hybrid program that sits at the intersection of mathematics and computer science. You'll learn to code mathematical models to solve problems in business, economics, engineering, environment, finance, medicine, and science.

### JESSIE'S FAVOURITE COURSES

- › **AMATH 242/CS371 Introduction to Computational Mathematics:** As part of getting introduced to this important field, we focused on the interplay between continuous models and their solution via discrete processes, as well as the pitfalls in computation.
- › **AMATH 342 Computational Methods for Differential Equations:** I liked how this course covered numerical methods for ordinary and partial differential equations while highlighting applications in the natural sciences, health sciences, engineering, and finance.
- › **CS 245 Logic and Computation:** This course made me think! It was all about logic, reasoning, and their implications, as well as the unprovability of formulae and undecidability of problems in computation.
- › **CO 372 Portfolio Optimization Models:** You'll look into computational optimization methodologies underlying portfolio problems, overall a course with visible real-world applications.
- › **CO 485 The Mathematics of Public-Key Cryptography:** This in-depth study of public-key cryptography included number-theoretic problems, prime number generation, integer factorization, discrete logarithms, public-key encryption, digital signatures, and secret sharing.

JESSIE

4A COMPUTATIONAL MATHEMATICS, CS MINOR, C&O MINOR, CO-OP

### WHY DID YOU CHOOSE COMPUTATIONAL MATH?

I began in the Honours Mathematics program because I love math. However, I soon developed an interest for computer science and the intersection between it and mathematics. Computational mathematics allows me to pursue all of my academic interests, while I learn how to tackle and solve big problems.





# WATERLOO IS A GLOBAL LEADER IN CO-OPERATIVE EDUCATION



Jessie has worked on developing her leadership and networking skills by being involved as a Math Faculty Ambassador and a Math Orientation leader.

## CO-OP STUDENTS AT WORK

Co-op bridges the gap between the classroom and the real world. Find opportunities to connect classroom theory with applications in a wide range of employment settings. During your co-op work terms, you will assume various job responsibilities, pick up new work-related skills, and earn competitive salaries.

### TYPICAL CO-OP POSITIONS

- › Business Systems Analyst, Roche Canada, **Jessie's first work term**
- › IT Assistant, Leysin American School, **Jessie's second work term**
- › Research Assistant, Soochow University, **Jessie's third work term**
- › Business Analyst, RBC, **Jessie's fourth work term**
- › Actuarial Analyst, The Economical Insurance Group, Waterloo
- › Lead Software Developer, Web Development Canada, Cambridge
- › Jr. Business Analyst Intern, Clear-to-Close Solutions, Denville

## STUDY AND CO-OP SEQUENCE 1\*

YR.	TERM	REGULAR	SEQ. 1
1	Fall	Study	Study
	Winter	Study	Study
	Spring	Off	<b>Work</b>
2	Fall	Study	Study
	Winter	Study	<b>Work</b>
	Spring	Off	Study
3	Fall	Study	<b>Work</b>
	Winter	Study	Study
	Spring	Off	<b>Work</b>
4	Fall	Study	Study
	Winter	Study	<b>Work</b>
	Spring		Study
5	Fall		<b>Work</b>
	Winter		Study

\* This study-work sequence is one of 4 choices of co-op sequences.

## UNDERGRADUATE RESEARCH OPPORTUNITIES

If you're curious about the research that professors conduct, research opportunities are available for strong undergraduate students. You could be paid for a part-time opportunity, or a full-time position may substitute as a co-op term. It's not uncommon for students to publish their work.

You can find details about the application, deadlines, and examples of research conducted by previous undergraduates in the department and school websites. Successful applicants are then matched with a professor.

## INDUSTRY APPLICATIONS

In every area of business and industry, we find problems that would benefit from mathematical modelling. Applying computer methods to such models is called 'scientific computation', but goes far beyond science into all areas of society. These simulations give us numerical answers, formulae, data sets, plots, charts, and images that help us to understand the nature of the world around us, and allow us to predict and influence the future.

To develop and analyze quantitative models we consider: the implications of finite-precision arithmetic; the efficiency, accuracy, and stability of numerical computations; the development and maintenance of mathematical software; and the effects of modern developments in computer architectures and networks. With these quantitative and computational skills, you'll be in demand around the world.

## GRADS AT WORK

- › Network Manager, Canada Institute of Linguistics, Langley
- › Process & Technology Officer, Canadian National Railway Co., Montreal
- › Development Analyst, Network-Centric Production & Technologies, IBM, Markham
- › Data Analyst, Green Chef, Boulder
- › Co-Founder & VP Engineering, Rubikloud Technologies Inc., Toronto
- › Institutional Analyst, University of Waterloo, Waterloo
- › Software Developer, Standard & Poor's DRI, Toronto
- › Application Developer, Klick Health, Toronto



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FACULTY OF MATHEMATICS  
COMPUTATIONAL MATHEMATICS ACADEMIC ADVISOR  
MARTIN PEI

mpei@uwaterloo.ca