



COMBINATORICS & OPTIMIZATION

CO-OP OR REGULAR

1st department of its kind in the world

Study discrete structures and operational efficiency

Combinatorics is fundamental to the field of computer science. Optimization, also known as mathematical programming, is a mathematical approach to find the best among a set of alternatives. This uniquely paired set of programs helped put Waterloo on the map back in the 1960s.

Today, Waterloo is home to the world's largest concentration of professors, researchers, and students in Combinatorics and Optimization. This research-intensive department has achieved international renown for its work in algebraic combinatorics, combinatorial optimization, continuous optimization, cryptography, graph theory, and quantum computing. Small upper-year classes, taught by professors who are leaders in their fields, give you an unparalleled learning opportunity.

CHEYENNE RECOMMENDS HER FAVOURITE COURSES

- › **CO 331 Coding Theory:** The first course I took in error-correcting codes. I really enjoyed the encoding and decoding schemes.
- › **CO 351 Network Flow Theory:** This is a nice course – I learned techniques to apply to several areas like transportation, distribution, job assignments, and critical-path planning problems.
- › **CO 342 Introduction to Graph Theory:** Covered key concepts in graph theory, such as connectivity, planarity, and matchings. Took this in honour of Professor Tutte!
- › **CS 466 Algorithm Design and Analysis:** I really liked learning about several different algorithmic approaches that are essential to almost all that relates to computing.
- › **CO 487 Applied Cryptography:** I feel like this was a great introduction to cryptography – symmetric ciphers, hash functions and data integrity, public key encryption, and digital signatures. And I found the applications interesting.

2,000+ combinations of courses you can choose from

96.6% of grads are employed within 2 years

CHEYENNE
COMBINATORICS &
OPTIMIZATION, CO-OP

CHEYENNE'S ADVICE TO STUDENTS

University is a whole new experience – often time-consuming and stressful – and living away from home can be hard. Knowing how to take time away from schoolwork to exercise, eat well, explore new hobbies, etc., is very important to success at university.

uwaterloo.ca/combinatorics-and-optimization





WATERLOO IS A GLOBAL LEADER IN CO-OPERATIVE EDUCATION



Cheyenne's extracurriculars include being a Women in STEM leader and a Math Ambassador, as well as playing volleyball.

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

- › Statistical Methods Analyst, BlackBerry, Waterloo, **Cheyenne's first work term**
- › Cryptographic Security Analyst, Bank of Nova Scotia, Toronto
- › Design Specialist, Telus, Vancouver
- › Information Systems Specialist, Toyota Canada, Cambridge
- › Quality Assurance, OpenText, Waterloo

STUDY AND CO-OP SEQUENCE 1*

YR.	TERM	REGULAR	SEQ. 1
1	Fall	Study	Study
	Winter	Study	Study
	Spring	Off	Work
2	Fall	Study	Study
	Winter	Study	Work
	Spring	Off	Study
3	Fall	Study	Work
	Winter	Study	Study
	Spring	Off	Work
4	Fall	Study	Study
	Winter	Study	Work
	Spring		Study
5	Fall		Work
	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 website. Successful applicants are then matched with a professor.

INDUSTRY APPLICATIONS

Combinatorics is fundamental to the field of computer science and an overwhelming majority of Fortune 500 companies use optimization in their day-to-day operations. Consequently, our graduates find employment in a variety of fields including: finance, software, insurance, telecommunications, retail and hospitality services, national defence, oil and gas, and engineering.

GRADS AT WORK

- › IT Manager, Exel Petroleum Technologies Ltd., Dar Es Salaam
- › Technical Services Professional, IBM China, Hong Kong
- › Analyst, Department of National Defence, Ottawa
- › Application Developer, Oracle Corporation Canada, St-Laurent
- › C.E.O., Stratum Technology Services Ltd., Waterloo
- › Analytics Team Member, Maple Leaf Sports & Entertainment Ltd., Toronto
- › Analyst, Manulife Bank of Canada, Kitchener



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FACULTY OF MATHEMATICS
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