



**UNIVERSITY
OF ALBERTA**

2023-2024

MASTER OF ENGINEERING

WATER RESOURCES ENGINEERING

WELCOME TO THE M.ENG. PROGRAM

The University of Alberta's Master of Engineering (M.Eng.) course-based programs are valuable for engineers at any career stage wishing to enhance their technical, managerial, and leadership skills. Our students learn from some of the top academics in their fields and train in internationally renowned facilities. Students participate in practical Alberta-focused projects that prepare them to demonstrate their skills and knowledge to potential employers.

M.Eng. students have access to the University of Alberta's Engineering Employment Center resources (job postings, workshops, networking opportunities, career fairs) and benefit from a dedicated student coach, who provides communications support.

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Cover photo: Flocculated frazil ice particles produced in our cold room laboratory. The image was captured under cross-polarised light, causing the crystals to appear coloured. Photo by Vincent McFarlane

M.ENG. PROGRAM INFO

PROGRAM OVERVIEW

The M.Eng. program is designed to prepare students for engineering practice in modern Water Resources Engineering, involving areas of design, analysis, monitoring, maintenance, and management of water resources systems. It will also equip students with the required knowledge, skills, methods, tools, experience, and professional capability to contribute to the Civil Engineering industry and society at large.

Through this program, students will increase their knowledge, deepen their understanding, and upgrade their skills in subjects fundamental to Water Resources Engineering, enabling them to excel in their field.

LEARNING OUTCOMES

- Gain a comprehensive understanding of the principles, theories, and concepts relevant to water resources engineering, including hydrology, hydraulics, water quality, and water management.
- Apply advanced technical skills and tools to analyze, design, and manage water resources systems effectively.
- Integrate knowledge from multiple disciplines to develop holistic approaches to water resources management and collaborate effectively with professionals from various fields.
- Critically analyze complex water resources engineering problems, evaluate alternative solutions, and make informed decisions considering technical, environmental, social, and economic factors.
- Communicate technical information clearly and effectively, both in written reports and oral presentations, to both technical and non-technical audiences.
- Prepare for professional practice in water resources engineering or further research by acquiring the necessary knowledge and skills to address real-world challenges and contribute to advancements in the field.
- Understand ethical and professional responsibilities and make informed judgements considering the impact of engineering solutions on global, economic, environmental, and societal contexts.



North Saskatchewan River
Photo: Chuankang Pei

M.ENG. PROPOSED COURSE SEQUENCE

The length of the program is two years. Students can accelerate or prolong the program after approval from the M.Eng. Academic Advisor (see program contacts on page 4).

Please refer to the Department's Graduate Handbook for full program policies.

<p>FALL 2023</p>	<p>CIV E 636 (River Ice Engineering) CIV E 641 (Advanced Surface Water Hydrology) CIV E 789 (Communications for Eng)</p>
<p>WINTER 2024</p>	<p>CIV E 635 (Environmental Fluid Mechanics) CIV E 645 (Water Resources Mgmt & Planning) Plus one 500-, 600- or 700-level, Engineering or Science courses, as approved by the MEng Academic Advisor</p>
<p>FALL 2024</p>	<p>Choose three electives: any 500-, 600- or 700-level Engineering or Science courses, as approved by the MEng Academic Advisor</p>
<p>WINTER 2025</p>	<p>CIV E 900 Capstone project (Directed Research – Water Resources section)</p>

STUDENT SUPPORT

GRADUATE PROGRAM ADVISORS

Trina Catral – 7-387 Donadeo ICE
Christina Ezekowitz – 7-381 Donadeo ICE
Arlene Figley – 7-389 Donadeo ICE
Ellie Kim – 7-385 Donadeo ICE

Email: cgradvis@ualberta.ca

ASSOCIATE DEAN GRADUATE STUDENTS CEE/MP

Dr. Zaher Hashisho – 7-241 Donadeo ICE
Email: ad.ceegrad@ualberta.ca

WATER RESOURCES GRADUATE COORDINATOR

Dr. Yuntong (Amy) She – 7-259 Donadeo ICE
Email: yshe@ualberta.ca

M.ENG. ACADEMIC ADVISOR

Dr. Yuntong (Amy) She – 7-259 Donadeo ICE
Email: civmeng@ualberta.ca

STUDENT COACHING SERVICES

The Department of Civil and Environmental Engineering is committed to supporting its M.Eng. students as they move through the program.

Students will be provided career and professional development supports throughout their program to aid them in developing their academic and career goals, recognizing and addressing challenges, and building upon their personal strengths to move past their limitations.

Dr. Robyn Braun will support students with their various writing projects and serve as instructor for the communications course. Dr. Braun will also serve as an additional resource and support for students as they navigate the program, the University, and the city of Edmonton.

Contact Dr. Braun at: robyn4@ualberta.ca

WORKING IN CANADA



INTERNATIONAL STUDENT SERVICES

International Student & Visitor Services (ISVS) provides programs, services and events for U of A international students. Their team of licensed immigration consultants and student advisors supports international students with adjusting to living in Edmonton, immigration and additional support to help international students succeed at the U of A.

You can book time with their team of licensed immigration consultants, who can assist you with study permits and extensions, immigration, and working in Canada. Drop-in appointments are available Monday to Friday (1–3 pm) by visiting the International Services Centre (142 Telus Centre) or book an appointment online at: ualberta.ca/international/about-uai/contact-us/international-services-centre

POST GRADUATION WORK PERMIT

The Post-Graduation Work Permit Program (PGWPP) allows students who have graduated from eligible Canadian designated learning institutions (DLIs) to obtain an open work permit to gain valuable Canadian work experience. Our program also provides academic credentials that are recognized by Alberta licensing organization (APEGA) for students with an undergraduate program in a foreign engineering program.

To work in Canada after you graduate, you must apply for a work permit under the Post-Graduation Work Permit Program (PGWPP). Check the [University's ISVS](#) and the [Government of Canada](#) websites for more information about the post-graduation work permit program.

Our program's learning outcomes are inline with Engineers Canada competencies and professional development hours count towards yearly professional requirements.

UNIVERSITY OF ALBERTA RANKINGS

	WORLD	CANADA
ACADEMIC RANKING OF WORLD UNIVERSITIES	91	4
QUACQUARELLI SYMONDS	111	4
TIMES HIGHER EDUCATION	118	6



WELCOME HOME

Edmonton is Alberta's capital city and is one of the sunniest cities in Canada with an average of 2,300 hours of sunshine per year. The river valley that winds through the city has more than 160 kilometres of maintained pathways and 20 major parks.

HOUSING

You may choose from many housing options for students, both on campus and around Edmonton. [International Student Services](#) has online resources for finding a place to live, including temporary accommodations when you first arrive.



EXCEPTIONAL PUBLIC SCHOOLS

Our Kindergarten through grade 12 public school system is one of the best in Canada. Alberta's students rank No. 2 in the world for reading and science and in the top 12 for math.



UNIVERSAL HEALTH CARE

[Alberta Health Services](#) provides health care to all Albertans in hospitals, at the doctor's office, and on the Internet. 811 is a telephone service providing free 24/7 nurse advice and general health information for Albertans.

COMMUNITY

More 150 neighbourhood community leagues provide plenty of opportunities to participate in social and recreational activities and get to know your neighbours.

Plus farmers' markets offer small agricultural producers the opportunity to sell fresh produce, including meat and vegetables that are grown in the Edmonton area. The city supports community gardens for those who want to grow their own food but need the space to do it.



TRANSPORTATION BUS, BIKE, TRAIN

Public transit buses and Light Rail Transit (LRT) connect the city along with well-maintained bike lanes and paths.

Maps, schedules and fare info at: edmonton.ca/edmonton-transit-system-ets



INDUSTRY NETWORKING MIXER

Academic knowledge is only part of the equation when preparing students for the workforce. Therefore, we commit to helping our students develop communication skills and professional networks.

In February 2023, the Department of Civil and Environmental Engineering and the School of Mining and Petroleum hosted a networking mixer for our Master of Engineering students. The mixer was part of an ongoing program to support grad students by providing communications training and professional development opportunities.

The mixer, held at the prestigious Royal Glenora Club in Edmonton's River Valley, brought together about 100 grad students and more than a dozen industry representatives for three hours of speakers, professional networking, and delicious food.

Structural engineer at DIALOG and UofA graduate Cam Franchuk gave an inspirational talk reflecting on what he's learned over his 21 years as an engineer. He gave practical advice about lifelong learning and getting your boots muddy, but a recurrent and appropriate overarching theme was the importance of communication. After his presentation, each industry representative came to the podium to introduce themselves, their company, and their work. The last part of the evening was dedicated to mingling and conversation between industry professionals and students.

Our students prepared for the event with a mock mixer training workshop earlier in the week. Dr. Robyn Braun, the Department's Instructor of Communications, and consultants from WorkSpark covered professional dress, conversation starters, handshakes, introducing yourself, and following up after the event.

The mixer and preparation workshop are just part of the support we provide graduate students to help them develop as professional engineers in Canada.



M.Sc. students Aisha Elgarhy, Veronica Wambura, and Syeda Narmeen Zehra at the graduate networking mixer.
Photo: Heather Egger

BENEFITS OF NETWORKING

Career opportunities Networking allows students to connect with potential employers, learn about job opportunities, and gain insights into the engineering profession.

Industry insights By connecting with professionals in their field, students can stay up-to-date with industry news and developments, helping them make informed career decisions.

Mentorship Networking provides students with the opportunity to connect with experienced professionals who can offer guidance and support as they navigate their career path.

Collaboration Working with others can help graduate students develop new skills, gain experience, and expand their engineering knowledge.

Personal development Networking helps students develop essential skills such as communication, teamwork, and interpersonal competence. By attending events, meeting new people, and building relationships, students develop confidence and expand their professional network.

Our department supports students with opportunities to develop professional communication skills and access to career resources.

We support our students in developing effective communication, teamwork, and adaptability through industry networking events, experiential learning opportunities, and professional development.

Through our professional development and communications support team, we help students develop their resumes, practice interviewing skills, and connect with potential employers. We also provide students with access to job fairs, networking events, and other professional development opportunities to help them build relationships and make valuable industry connections.

INSTRUCTOR OF COMMUNICATIONS

Dr. Robyn Braun – 7-240 Donadeo ICE
Email: robyn4@ualberta.ca

WORKSPARK CONSULTING

Professional development workshops in resume writing and networking
Web: workspark.ca

COURSE INFO

CIV E 631 ENGINEERING FLUID MECHANICS

COURSE OBJECTIVES

The primary objective of the course is to significantly increase students' knowledge of engineering fluid mechanics. Students will learn to derive exact solutions to the Navier-Stokes equations and to apply potential flow theory to solve fluid flow problems. They will also acquire a deeper understanding of boundary layer theory, vorticity, and turbulence.

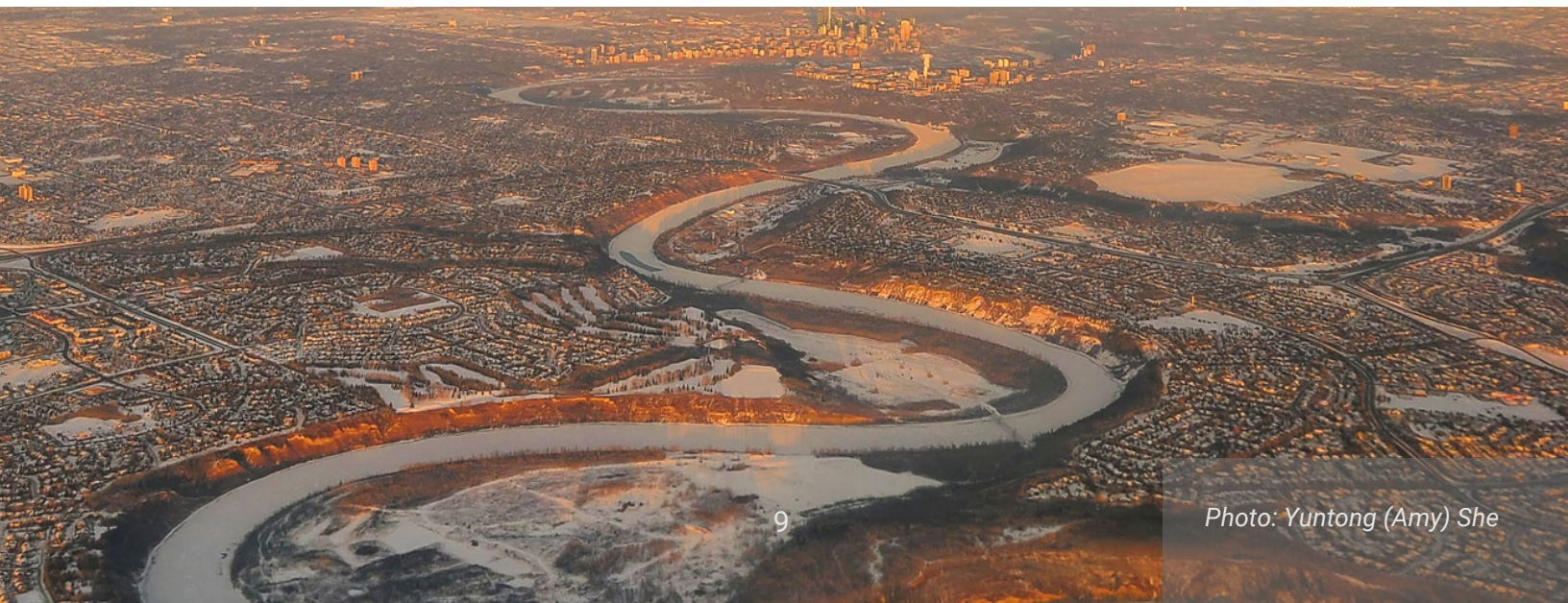
LEARNING OUTCOMES

- Understand the principles of mass, momentum, and energy conservation as they apply to incompressible flows.
- Solve inviscid flow problems using potential flow theory and superposition.
- Sketch streamlines, pathlines, and streaklines and use these concepts to elucidate flows.
- Derive exact solutions to the Navier-Stokes equations for incompressible flows.
- Predict the behaviour of turbulent flows using theory and empirical methods.

CIV E 635 ENVIRONMENTAL FLUID MECHANICS

COURSE OBJECTIVES

Mixing processes and pollutant transport in rivers, lakes, estuaries, coastal waters, and the atmosphere.



Flocculated frazil ice particles produced in our cold room laboratory. The image was captured under cross-polarised light, causing the crystals to appear coloured.

Photo and cover: Vincent McFarlane



CIV E 636 RIVER ICE ENGINEERING

COURSE OBJECTIVES

This course focuses on topics in River Ice Engineering, focusing on the hydraulics and engineering aspects of river ice. It involves a combination of lectures, assigned readings, interactive discussions, and hands-on calculations.

LEARNING OUTCOMES

- Understand various river ice processes during the winter season.
- Conduct hydraulic modeling under ice affected conditions.
- Obtain knowledge of available techniques for ice jam flood forecasting and mitigation.
- Understand the strength characteristics of ice and design for different loading scenarios.
- Obtain up-to-date knowledge of the field and identify gaps and potential research areas.
- Broaden the view of ice effects in various engineering applications.
- Improve technical writing, communication, and presentation skills.

COURSE INFO

CIV E 641 ADVANCED SURFACE WATER HYDROLOGY

COURSE OBJECTIVES

The objective of the course is to provide a comprehensive understanding of hydrology and its various components, including the world's water resources, hydrologic processes, atmosphere, hydrosphere, cryosphere, and the impacts of climate change.

LEARNING OUTCOMES

- Understand the world's water resources, the hydrologic cycle, and the various forms of water on Earth.
- Comprehend physical hydrologic and atmospheric processes, including the influence of phenomena like ENSO.
- Learn about precipitation, evaporation, and their related physical processes and models.
- Study soil moisture, infiltration processes, and the cryosphere, including snowpacks, glaciers, and permafrost.
- Explore the impacts of climate change on the cryosphere and global sea-level rise.
- Gain knowledge of hydrologic applications, modelling techniques, and deterministic hydrologic models like the Sacramento model.

CIV E 645 WATER RESOURCES MANAGEMENT AND PLANNING

COURSE OBJECTIVES

The course material applies economics, operations research, management science, systems modeling and analysis, and statistics to water resources problems for the design, analysis, operation, and management of various types of water projects. The tools used are meant for water quantity management. The design and operations of hydro systems are addressed, using operation research techniques such as linear programming, dynamic programming, nonlinear programming, and simulation modelling.

LEARNING OUTCOMES

In the context of water quantity management and operations of hydro systems, the students will,

- Learn the fundamentals of economic analysis of water resources projects.
- Understand and solve linear programming (LP) problems with the Simplex method, with a focus on water problems.
- Understand the basics of dynamic programming.
- Understand and solve nonlinear programming (NLP) problems through calculus, line search algorithms, and the generalized reduced gradient approach.
- Learn the basics of simulation and the system dynamics methodology.
- Apply optimization tools to analyze a water resources problem relevant to Alberta.



Photo taken just after the 2019 Ottawa River flood by Yuntong (Amy) She

CIV E 739

ADVANCED TOPICS IN FLUID MECHANICS AND HYDRAULICS - OPEN CHANNEL FLOW

COURSE OBJECTIVES

This course is focussed on the principles of open channel flow, including: open channel flow classifications; energy and momentum principles; critical flow; uniform, gradually varied, and rapidly varied flow; unsteady flow; and flood routing. Students will learn the theory required to analyse and solve open channel flow problems, and will gain experience modelling open channel flows using industry standard software.

LEARNING OUTCOMES

- Acquire fundamental knowledge of open channel hydraulics including uniform flow, gradually varied flow, rapidly varied flow, unsteady flow, and flood routing.
- Analyse and solve theoretical open channel flow problems.
- Understand fundamental open channel flow principles and apply them to solving practical issues.
- Understand and apply best practices for modelling open channel flows.

COURSE INFO

CIV E 789 WRITING/COMMUNICATION SKILLS FOR ENGINEERS

COURSE OBJECTIVES

This course introduces M.Eng. students to the development of standard documents used in an engineering career, as well as the fundamentals of technical writing and communication, and of effective professional communication.

LEARNING OUTCOMES

- Communicate effectively and respectfully in diverse settings, in person and via standard business documents, such as email.
- Identify and abide by the rules of plagiarism and academic and professional standards of communication.
- Evaluate their own writing process and institute changes when necessary.
- Solicit and provide actionable feedback on writing and other forms of communication.
- Recognize and produce standards for specific technical documents.
- Research and consider the context, audience, and purpose of their writing projects.
- Write a thesis statement and organize their writing at various levels, from document-level through to sentence structure.
- Identify active and passive voice, and use each appropriately.
- Recognize and evaluate rhetorical devices, strategies, and techniques.

CIV E 900 CAPSTONE DIRECTED RESEARCH PROJECT WATER RESOURCES

The Department of Civil and Environmental Engineering offers the Capstone project course to M.Eng. students in the Water Resources Engineering stream.

Students will complete directed research projects as part of this course using the knowledge they have gained throughout their undergraduate and graduate program.

Please see the M.Eng. Academic Coordinator for information about the directed research project.

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