



**UNIVERSITY  
OF ALBERTA**

**2023-2024**

# MASTER OF ENGINEERING

## TRANSPORTATION 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

# M.ENG. PROGRAM INFO

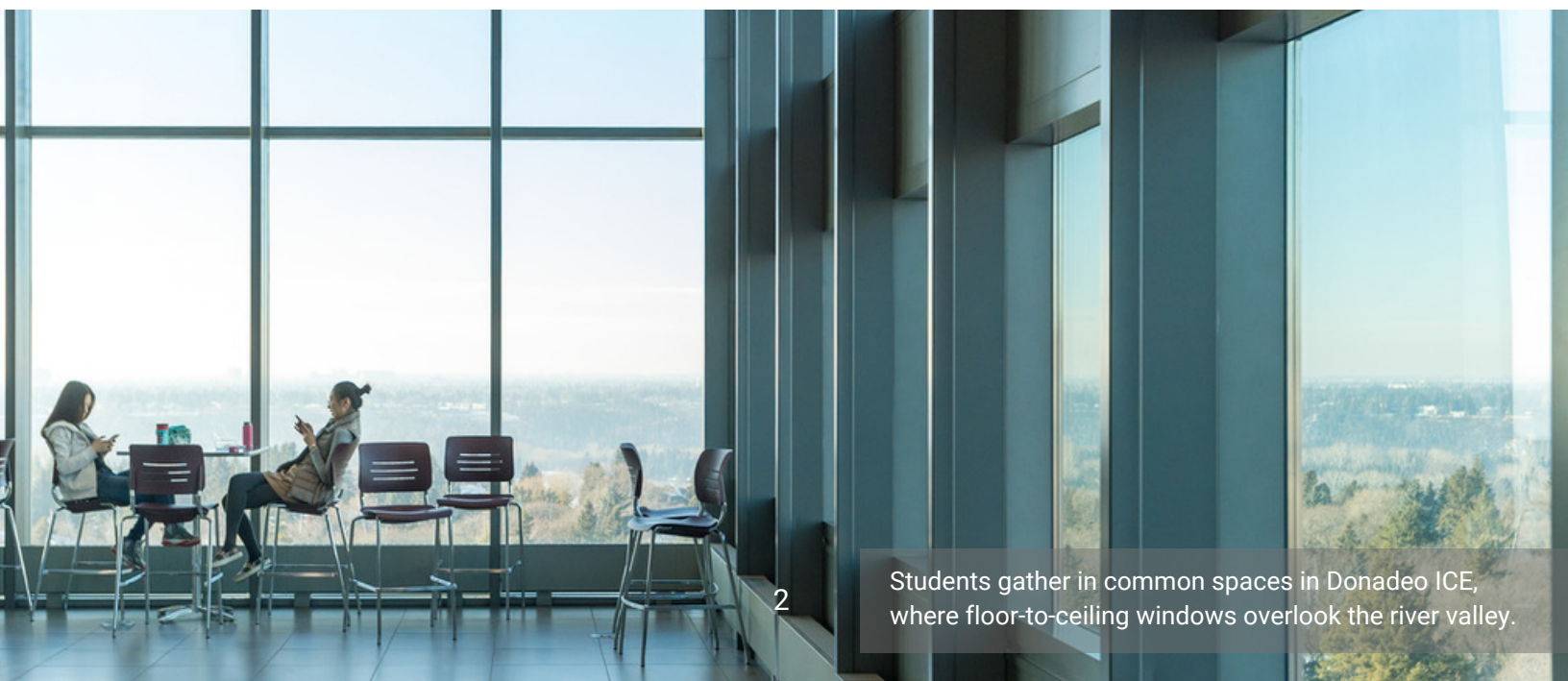
## PROGRAM OBJECTIVES

The M.Eng. Program is designed to prepare students for engineering practice in modern Transportation Engineering. It will also equip students with the required knowledge, skills, methods, tools, experience, and professional communication capability to contribute to Civil Engineering industry and society at large.

The program prepares the students for an entry career in the Transportation Engineering industry.

## LEARNING OUTCOMES

- Plan, design, analyze, and evaluate a wide range of transportation systems and operations
- Understand and apply fundamentals of transportation engineering including: traffic control, demand analysis, transportation facility design, geomatic analysis, safety evaluations, and pavement design.
- Understand and apply traditional and emerging concepts and goals in transportation including: accessibility, safety, efficiency, sustainability, resilience, and equity
- Communicate technical transportation engineering analyses, results, and ideas to broader and non-technical audiences
- Conduct and oversee practice-oriented projects using learned concepts in a collaborative and team-oriented setting
- Guide the development and operations of transportation systems toward the public good for the benefit of society
- Apply transportation engineering knowledge across a wide range of professions and careers in the transportation field, including those beyond engineering such as technology, policy, and planning



Students gather in common spaces in Donadeo ICE, where floor-to-ceiling windows overlook the river valley.



# M.ENG. PROPOSED COURSE SEQUENCE

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

Please refer to the Graduate Handbook for full program policies.

<p>FALL <b>2023</b></p>	<p>CIV E 612 (Transportation Planning: Methodology &amp; Techniques) CIV E 616 (Traffic Safety) CIV E 789 (Writing/Comm for Engineers)</p>
<p>WINTER <b>2024</b></p>	<p>CIV E 719 (Sustainable &amp; Resilient Transportation) CIV E 719 (Advanced Pavement Material &amp; Design) <b>Plus one</b> 500/600/700 level General Engineering Elective, <i>as approved by the MEng Academic Coordinator</i></p>
<p>FALL <b>2024</b></p>	<p>CIV E 614 (Traffic Operation &amp; Control) CIV E 779 (Machine Learning for Engineers) CIV E 779 (Future Infrastructure Systems)</p>
<p>WINTER <b>2025</b></p>	<p>CIV E 900 Capstone project (Directed Research – Transportation 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](mailto:cgradvis@ualberta.ca)

## ASSOCIATE DEAN GRADUATE STUDENTS CEE/MP

Dr. Zaher Hashisho – 7-241 Donadeo ICE  
Email: [ad.ceegrad@ualberta.ca](mailto:ad.ceegrad@ualberta.ca)

## TRANSPORTATION GRADUATE COORDINATOR

Dr. Stephen Wong – 6-269 Donadeo ICE  
Email: [stephenwong@ualberta.ca](mailto:stephenwong@ualberta.ca)

## M.ENG. ACADEMIC COORDINATOR

Dr. Yuntong (Amy) She – 7-259 Donadeo ICE  
Email: [civmeng@ualberta.ca](mailto: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](mailto: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](http://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	<b>91</b>	<b>4</b>
QUACQUARELLI SYMONDS	<b>111</b>	<b>4</b>
TIMES HIGHER EDUCATION	<b>118</b>	<b>6</b>



# 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](http://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](mailto:robyn4@ualberta.ca)

### WORKSPARK CONSULTING

Professional development workshops in resume writing and networking  
Web: [workspark.ca](http://workspark.ca)





## **CIV E 612 TRANSPORTATION PLANNING: METHODOLOGY AND TECHNIQUES**

### **COURSE OBJECTIVES**

The objective of this course is to provide students an in-depth discussion on the fundamental concepts and methodologies applied in the urban transportation planning process. The primary focus of the course is on the development of various models applied in the urban demand forecasting process, including traditional four-step models and activity-based models (ABM). Important methodologies that will be covered in this course include linear (logistic) regression, categorical analysis, random utility maximization (RUM) theory, maximum likelihood (ML) estimation, shortest path algorithm, equilibrium assignment methods.

### **LEARNING OUTCOMES**

- More in-depth introduction to transportation planning and real-world issues.
- In-depth introduction to transportation demand modelling.
- Training on how to write papers and deliver presentations.

## **CIV E 614 TRAFFIC OPERATION AND CONTROL**

### **COURSE OVERVIEW**

Human factors, traffic control devices, signal warrants, principles of signalized intersections, signal timing, signal optimization and coordination, capacity, traffic delay, left turn, diamond interchange, unsignalized intersection, roundabouts, actuated control, incident management, freeway control.

# COURSE INFO

## CIV E 616 TRAFFIC SAFETY

### COURSE OBJECTIVES

Introduction to traffic safety. Focus on collisions and exposure. Safety management process. Collision modeling, theory and applications. Safety evaluation techniques, challenges, opportunities, influence of confounding factors and regression to the mean bias. The following topics will be covered:

- Introduce traffic safety: Overview of safety in Canada and the world. Fundamentals of traffic safety. Extent and nature of problem. Historical, national, and global perspectives.
- Understanding the Safety Management Process: Different stages and processes, screening tools, collision data analysis, problem identification, recommendation of countermeasures to correct safety problems, and procedure to conduct an economic appraisal of any proposed countermeasure.
- Provide an overview of the different Safety Analysis Methods: conventional and Bayesian analysis techniques including strengths and weaknesses. Collision modeling theory and applications (linear, Poisson, negative binomial, zero-inflated, etc.)
- Provide an overview of the different Safety Evaluation Techniques: Cross-sectional vs. time series studies to evaluate safety countermeasures, strengths and weakness, challenges and opportunities, target crashes, influence of confounding factors. Regression to the mean. Empirical Bayes' and Bayes' techniques. Applications and Case Studies.

### LEARNING OUTCOMES

- Explain the main paradigm shifts in traffic safety
- Understand the fundamentals of traffic safety
- Explain and apply the safety management process
- Understand and apply conventional analysis safety techniques
- Understand and apply Bayesian analysis safety techniques
- Develop and apply safety performance functions
- Understand the different safety evaluation methods
- Design a safe roadside environment





## CIV E 719 SUSTAINABLE AND RESILIENT TRANSPORTATION

### COURSE OBJECTIVES

The course will provide an introduction and overview of transportation sustainability, resilience, and equity, including their connections to engineering design, policy, and land use. The sustainability section of the class will survey a variety of strategies used to reduce the impact of transportation on climate change, pollution, and environmental degradation. Topics will include: public transit, shared mobility, walking, cycling, intelligent transportation systems, freight/logistics, and pricing. The resilience section of the class will focus on strategies to safely protect infrastructure and populations from hazards (both natural and man-made). Topics will include: resilient infrastructure, street design, community design, evacuations, transportation responses in disasters, and recovery mechanisms. The course will focus on written and oral communication, prepare transportation engineers for a diverse range of professions, and encourage the adoption of emerging and innovative engineering strategies and ideas.

### LEARNING OUTCOMES

- Define, describe, and provide examples of sustainable, resilient, and equitable transportation systems, infrastructure, and plans
- Understand the effects of transportation systems on climate change and the environment
- Understand the effects of hazards on transportation systems
- Describe and apply different transportation modes and strategies to reduce greenhouse gas emissions and environmental impact
- Describe and apply different transportation concepts and strategies to increase infrastructure, operational, and community resilience to chronic disruptions and acute shocks
- Communicate sustainability, resilience, and equity ideas in written and oral forms
- Guide transportation planning and operations toward more sustainable and resilient outcomes in their work

# COURSE INFO

CIV E 719

## ADVANCED PAVEMENT MATERIAL AND DESIGN

### COURSE OBJECTIVES

The objective of the course is to introduce graduate students the main concepts of design and construction of asphalt pavement systems. The first part of the course refreshes students' knowledge of the pavement structure, materials and testing. Also, introducing Superpave classification for asphalt binders. The second part of the course addresses the advanced analysis/design of flexible pavement structures, including Empirical and Mechanistic-Empirical methods considering climate and environmental impacts. The students will have the opportunity to interact with professionals in the pavement industry who will serve as guest speakers during the course.

### LEARNING OUTCOMES

- Describe pavement material specifications (soil and asphalt binder) and design factors of flexible pavements.
- Define materials requirements and characteristics for pavement construction and rehabilitation.
- Analyze stresses and strains in flexible pavements layers using computer software.
- Design of flexible pavement using Empirical and Mechanistic-Empirical Methods.
- Identify pavement failures and maintenance methods
- Evaluate pavement load bearing capacity and layers stiffness using non-destructive testing methods.

CIV E 779

## MACHINE LEARNING FOR ENGINEERS

### COURSE OBJECTIVES

The main objective of this course is to present the basic pillars of sustainability, the concepts of multidimensional thinking and rational decision-making in order to enable the students to make the most sustainable decisions in the construction industry.

### LEARNING OUTCOMES

- Understand the three pillars of sustainability: Economic, Environmental & Social and the United Nations (UN) 17 Sustainable Development Goals (SDG).
- Comprehend the basic techniques utilized to transfer data to useful knowledge, which can be used for timely decision-making.
- Use Multiple Criteria Decision Making (MCDM) methods to develop Knowledge-Based Decision Support Systems (KBDSS).
- Utilize KBDSS to obtain the most sustainable: engineering designs, project procurement practices, construction methods and building materials.

# COURSE INFO

## CIV E 719 GEOMATICS APPLICATIONS IN TRANSPORTATION ENGINEERING

### COURSE OBJECTIVES

#### OPTIONAL

Current applications of Geographic Information System (GIS) and Remote Sensing (RS) in Transportation Engineering and related technologies in geographic research are examined through lectures, tutorials (labs), and term projects. The course will cover the principles and operations of GIS software through computer-based exercises using various spatial mapping and (geo)statistical methods. This course will also introduce selected spatial analysis techniques and provide an opportunity to acquire statistical computing skills using Esri's ArcGIS.

### LEARNING OUTCOMES

- Gain an understanding of fundamental principles and methods of GIS/RS;
- Familiarize with current issues pertaining to the application of GIS/RS;
- Learn and apply spatial statistical methods to solve various transportation-related problems involving regionalized (random) variables.
- Develop spatial interpolation models (e.g., kriging) to predict unknown values and their estimation uncertainty.
- Solve common network problems using shortest distance and route, location-allocation, closest facility, service areas and accessibility analyses via computerized techniques and GIS software.
- Expand functional knowledge and operations of Esri's ArcGIS for solving real-world engineering problems.



# COURSE INFO

CIV E 779

## FUTURE INFRASTRUCTURE SYSTEMS IN SMART, SUSTAINABLE, AND RESILIENT CITIES

### COURSE OBJECTIVES

This highly interdisciplinary course is intended for senior year undergraduate students and graduate students. The course will introduce various emerging concepts and technologies in the context of smart and sustainable cities and provide an overview of future cities and their main components, such as Future Infrastructure Systems, Future Energy Systems, and Future Mobility Systems. With a particular emphasis on the Future Infrastructure Systems and their sustainability and resiliency, this course will cover various related topics in the context of such as sensing technologies, data analytics, AI, as well as interdependencies, operation, management, and decision-making for/of Future Infrastructure Systems.

### LEARNING OUTCOMES

- Identify the main components of future infrastructure systems and their roles in smart, sustainable, resilient cities;
- Apply recent advances in emerging technologies such as sensing, data analytics, and AI for FIS;
- Monitor, assess, and manage the next generation infrastructure systems;
- Describe interdependencies and the requirements of resiliency of FIS; and
- Adapt existing infrastructure structure systems to future cities in the context of sustainability and resiliency in the face of climate change.



# 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 TRANSPORTATION SECTION

The Department of Civil and Environmental Engineering offers the Capstone project course to M.Eng. students in the Transportation 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 Transportation section.

# NOTES