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.
PROGRAM OBJECTIVES

The M.Eng. Program is designed to prepare students for engineering practice in modern Geotechnical 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 students for engineering practice in modern Geotechnical Engineering, involving areas of design, analysis, inspection, monitoring, and maintenance. It will equip students with the required knowledge, skills, methods, tools, experience, and professional communication capability to contribute to the civil industry and the society.

LEARNING OUTCOMES

- Gain and apply knowledge of mechanics, analysis, design, and data analytics in engineering practice for a variety of geotechnical structures (e.g., cut slopes, embankments, foundations, dams).
- Understand and follow national or international standards, codes and industry manuals to design safe and economical geotechnical structures and perform ground investigations.
- Obtain relevant knowledge about emerging technologies and techniques to manage geotechnical projects in the modern society.
- Collaborate effectively with team members on capstone projects and communicate to team members as well as other target audiences.
- Develop the foundational knowledge and awareness for life-long learning to continue the professional growth, thus being adaptable to the ever-evolving industry needs.
- Understand ethical and professional responsibilities and make informed judgments considering the impact of engineering solutions in global, economic, environmental, and societal contexts.
# M.Eng. Program Info

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).

See detailed course descriptions on pages 7–13 and refer to the Graduate Handbook for full program policies.

| FALL 2022               | CIV E 697 (Rock Engineering)  
|                         | CIV E 680 (Properties of Soils)  
|                         | CIV E 789 (Writing/Comm for Engineers)  |
| WINTER 2023             | CIV E 690 (Adv Foundation Engineering)  
|                         | CIV E 695 (Soil Structures)  
|                         | **Plus one of**  
|                         | CIV E 609 (Underground trenchless)  
|                         | CIV E 698 (Geomechanics)  |
| FALL 2023               | CIV E 683 (Site Investigation)  
|                         | CIV E 684 (Geology and Terrain)  
|                         | **Plus one of**  
|                         | CIV E 682 (Env Geotechnics)  
|                         | CIV E 789 (Risk Mgmt)  |
| WINTER 2024             | CIV E 900 Capstone project (Directed Research - Geotechnical section)  
|                         | **Optional**  
|                         | CIV E 681 (Seepage and Drainage)  |
GRADUATE PROGRAM ADVISORS

Ellie Kim – 7-209 Donadeo ICE
Arlene Figley – 7-211 Donadeo ICE
Trina Catral – 7-215 Donadeo ICE

Email: cgradvis@ualberta.ca

ASSOCIATE DEAN GRADUATE STUDENTS CEE/MP

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

M. ENG. ACADEMIC COORDINATOR

Dr. Selma Guigard – 7-233 Donadeo ICE
Email: civmeng@ualberta.ca

GEOTECHNICAL GRADUATE COORDINATOR

Dr. Michael Hendry – 6-226 Donadeo ICE
Email: hendry@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 Services (ISS) 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/advising

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 ISS 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

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<thead>
<tr>
<th>Ranking</th>
<th>WORLD</th>
<th>CANADA</th>
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<td>4</td>
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<tr>
<td>Times Higher Education</td>
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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.

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.

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.

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
CIV E 609
UNDERGROUND TRENCHLESS CONSTRUCTION

COURSE OBJECTIVES

Introduction to underground pipeline infrastructure. Focus on pipeline condition assessment. New construction such as horizontal directional drilling, pilot tube microtunneling, pipe bursting, and pipe jacking. Rehabilitation methods such as cured in place pipe lining, geotechnical consideration. Risk considerations for underground projects.

LEARNING OUTCOMES

- Understand the underground infrastructure and learn about the complexities of the utility system
- Learn about different underground trenchless construction methods and the advantages and disadvantages of each method.
- Design a new pipe installation method using Horizontal Directional Drilling (HDD) from a desktop study to complete the design stage and learn all aspects of the construction phase.
- Design a rehabilitation method using Cured In Place Pipe (CIPP) method and identify all details required for the lining of a pipe
- Get a comprehensive skill with respect to reading and understanding ground conditions and identifying the right technology for the proposed utility line.
CIV E 680
ENGINEERING PROPERTIES OF SOILS

COURSE OBJECTIVES


LEARNING OUTCOMES

- Develop an understanding of the impact of soil composition and clay mineralogy on the mechanical behaviours of soils.
- Develop an advanced understanding of the concept and importance of effective stress.
- Be able to calculate and plot the total and effective stress paths of common soil testing methods. And the basis for deriving these paths for other conditions.
- Identify the meaning of the concepts of yield, strength and critical state and relate this to observed soil responses to triaxial testing.
- To apply elastic-plastic models (example: Cam Clay) to represent elastic and plastic deformation of soil in both shear and volumetric strain and to evaluate the effect of the soil’s pore pressure response to loading during undrained or partially drained conditions.

CIV E 681
SEEPAGE AND DRAINAGE

COURSE OBJECTIVES

Elements of hydrogeology; regional groundwater flow, borehole logging methods. Theory of groundwater flow through soils and rocks, permeability, Darcy’s law, field governing equations and their solution by approximate methods, finite difference and finite element methods, unsaturated flow. Civil engineering applications, seepage in earth structures, design of dewatering systems for excavations and slopes, field testing, grouting.

LEARNING OUTCOMES

- Understand the nature of groundwater flow.
- Analyze and quantify seepage through porous media.
- Design for the influence of seepage on engineering projects.
- Design seepage control methods.
- Understand seepage in rocks and contaminant transport
CIV E 682
ENVIRONMENTAL GEOTECHNICS

COURSE OBJECTIVES
Environmental laws and regulatory processes; geotechnical characterization for environmental problems; transfer processes; concepts in thermodynamic equilibrium chemistry; geochemical processes in groundwater and mineral-water-atmosphere interaction; geotechnical and geochemical aspects of mine waste management.

LEARNING OUTCOMES
- Understand and apply management practices that protect the geoenvironment from deleterious and adverse stressor impacts generated from sources associated with the efforts in support of the needs of humans. Specific objectives and topics include:
- Understand the physical and chemical stressors imposed by mining resource extraction on the geoenvironment
- Understand the regulatory environment pertaining to mine waste management
- Apply the fundamental principles and theories of geotechnical engineering and geomechanics for sustainable management of mine waste
- Understand the fundamental principles and theories of geochemistry for sustainable management of mine waste

CIV E 683
SITE INVESTIGATION PRACTICE

COURSE OBJECTIVES
Techniques of site investigation for geotechnical engineering, in situ testing, instrumentation for field performance studies, case histories covering both rock and soil applications.

LEARNING OUTCOMES
- Plan, review and criticize geotechnical site investigations for a variety of geotechnical projects, with the aim of developing adequate geotechnical models,
- Select the most appropriate methods for sub-surface investigation, testing, and sampling, in light of the required level of detail for the project (conceptual, feasibility, detail design, etc.),
- Identify the needs for adopting geophysical and remote sensing techniques, as well as knowing the advantages these techniques bring in terms of enhanced density of information and potential cost-reduction for increased design confidence; and their limitations;
- Plan, review and criticize geotechnical monitoring requirements, instrumentation selected and frequency; to monitor for deformations and pore water pressures and with some discussions of stress and load measurements; and,
- Understand the site investigation requirements for geo-environmental investigations.
CIV E 684
ENGINEERING GEOLOGY AND TERRAIN ANALYSIS

COURSE OBJECTIVES
Information sources in engineering geology and terrain analysis, elements of the geology of sediments and glacial geology. Glacial and periglacial land forms. Photogeology and airphoto interpretation applied to geotechnical engineering. Case histories based on specific materials and regional problems.

LEARNING OUTCOMES
• Recognize and identify virtually all the significant terrain types and landforms found in Canada.
• Understand and describe the geomorphology and landforming processes active in Canadian landscapes.
• Understand and apply the basic principles of terrain evaluation using aerial photographs.
• Predict and estimate the engineering properties of surface soils on the basis of aerial photographs.
• Design, optimize and plan comprehensive field investigations and drilling programs with aerial photos
• Complete conceptual level engineering designs for large engineering projects such as river crossings, dams and waste repositories using aerial photos.
• Complete route location and associated risk analysis for major infrastructure projects such as railways, pipelines, power lines with aerial photos.

CIV E 690
ADVANCED FOUNDATION ENGINEERING

COURSE OBJECTIVES

LEARNING OUTCOMES
• Select in-situ investigation methods including SPT and CPT and interpret engineering parameters for design purpose
• Design shallow foundations using the principle of ultimate limit states; be familiar with the foundation design manuals in Canada
• Design single deep foundations and pile groups for the axial and lateral limit states using the manuals in Canada; understand the piling practice and pile test methods
• Calculate earth pressures for design purpose; select and design earth retaining systems of various types and the structures for deep excavation support; be familiar with the manuals
• Understand the functions of geosynthetics; design for internal and external stability of mechanically-stabilized earth walls and slopes; select and design geosynthetics for drainage purpose.
COURSE INFO

CIV E 695
SOIL STRUCTURES

COURSE OBJECTIVES


LEARNING OUTCOMES

- Develop an understanding of the physical meaning of limit equilibrium analyses for evaluating slope stability and the underlying calculations, assumptions and implications associated with common methods of limit equilibrium analyses.
- Conduct and critically review limit equilibrium analyses of slopes, and evaluate Factors of Safety.
- Develop an understanding of the physical meaning of shear strength reduction methods for evaluating slope stability and the underlying calculations, assumptions and implications associated with these methods.
- Conduct and critically review shear strength reduction analyses of slopes, and evaluate Factors of Safety.
- Develop an understanding of the impacts of soil type and settings on evaluating the Factors of Safety.
- Identify the setting for stability analyses applicable to dams and the design and construction methods employed to improve the survivability and serviceability of final structures.

CIV E 698
PETROLEUM GEOMECHANICS

COURSE OBJECTIVES

Application geotechnical engineering principles to petroleum engineering problems. Principles of thermoporoeelasticity are reviewed. Borehole stability, hydraulic fracturing, subsidence/heave, sand production, formation damage and reservoir-geomechanical modelling are the major topics for the course. Special attention is given to geomechanical influences on reservoir flow processes.
COURSE INFO

CIV E 789
RISK MANAGEMENT PRINCIPLES AND TOOLS

COURSE OBJECTIVES

Build skills, competencies, and capabilities in risk management principles and tools through application of the incident investigation and root cause analysis work processes in both process (technical) safety and occupational safety risk management.

LEARNING OUTCOMES

- Appraise the safety culture of an organization and obtain skills to positively influence the safety culture of an organization towards improving or sustaining the safety performance.
- Apply several leadership tools to evaluate workplace conditions and practices and recommend management system improvements.
- Apply a set of incident investigation and root cause analysis tools to historical loss incidents; adapt those tools to a variety of engineering contexts; link latent causes to management system elements; and recommend management actions to improve the safety performance of an organization.
- Explain relevant portions of Alberta’s Occupational Health and Safety Code and the Engineering and Geoscience Professions Act in relation to due diligence and the application of risk management principles within the practice of professional engineering.
- Apply risk management tools to evaluate and mitigate risk from a loss incident or relevant aspect of your graduate studies research work.
- Undertake an incident investigation and perform a root cause analysis on a loss incident.
- Develop and present a term paper critiquing a loss incident with respect to RME weaknesses and provide recommendations for eliminating latent causes.
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
GEOTECHNICAL SECTION

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