CEE Graduate Course Descriptions – Winter 2024

GENG-8020. Engineering Project Management
This course will expose students to principles, concepts, and tools utilized in project management activities. This course will include topics such as defining project scope, and time, cost, risk, procurement and stakeholder management. The students will be engaged in working on a major project to develop proficiency in project management activities and tools. (Open to Masters of Engineering and Masters of Engineering Management students, excluding students in the MEng Auto Program. Open to engineering MASc/PhD students on permission of the department/faculty as a qualifying course only. Will not count for credit towards MASc/PhD degree.
Instructor: Dr. L. Miller-Branovacki, Mr. J. Linton, Mr. P. Bziuk, Dr. M. Alsharqawi

CIVL 8020: Building Information Modeling
Practical and theoretical applications of building information modeling (BIM) in civil and environmental engineering projects. Understand BIM standards (e.g., ISO), use BIM software for buildings, and conduct BIM-based analysis (e.g., solar analysis, structural analysis, and energy analysis). Enhance the efficiency of project management with the aid of BIM.
(Antirequisite: CIVL 8900-50.)
Instructor: Tharindu Dodanwala

CIVL 8310: Prestressed Concrete
Materials, principles of prestressing systems; prestressing losses; analytical treatment of the effect of shrinkage, creep of concrete, and cable friction on stresses; analysis and design of statically determinate and indeterminate structures; design codes; research background; introduction to prefabricated concrete structures. (3 lecture hours a week.)
Instructor: Dr. W. Tape

CIVL 8360: Earthquake Engineering
Fundamental principles of earthquake engineering: seismology and strong ground motions, seismic hazard analysis, structural dynamics, methods of analysis and design, building code provisions for seismic design, and base isolation.
Instructor: Dr. N. Van Engelen

CIVL 8900-6: Special Topics: Climate Change Adaptation
This course explores foundational concepts of climate change; global scale, regional scale, and local scale changes; different climate models and the data produced by them; how to determine the time series of climate data for a watershed or a design precipitation for a specific site; hydrological modeling, and assessing the impacts on water resources and urban water systems. After the students are exposed to these tools, they will explore adaptation strategies to mitigate the impacts, such as low impact development strategies and other planning/design alternatives. The course will be concluded with an introduction to how the strategies could be applied in the context of a watershed.
(Cross-listed with ENVE 8900-6).
Instructor: Dr. M. M. Rahman

CIVL 8900-10: Special Topics: Traffic Operation Control
This course introduces concepts and methods for the analysis of the performance of vehicle traffic and explains how these are applied to operational design of efficient transportation facilities including freeways and signalized/unsignalized intersections. Students will evaluate the impacts of various operational design techniques on traffic performance using mathematical and analytical methods.
Instructor: Dr. C. Lee

CIVL 8900-15: Special Topics: Open Channel Flow
This course introduces concepts and methods for the analysis of flow in open channels. The following topics will be covered: Classification of Open-channel Flow, Governing Equations, Specific Energy and Specific Force, Hydraulic jumps, Surges and Bores, Uniform Flow, Gradually Varied Flow, Channel Control Structures, Hydraulic Structures, Sediment Transport, Hydraulic Modelling.
(Cross-listed with ENVE 8900-12)
Instructor: Dr. R. Balachandar

CIVL 8900-22: Special Topics: Hydrology Concepts and Applications
The course introduces the concepts of Hydrologic Cycle and its components: 1) Precipitation: intensity, frequency, duration; hydrologic losses. 2) Runoff: storms, conceptual models, unit hydrograph principles, channel, and reservoir flood routing. Students will learn the techniques to analyse the hydrograph and methods to estimate the streamflow and develop rating curves. Fundamental concepts taught include probability applications and frequency analysis of precipitation and streamflow for predicting floods and droughts. Students will learn about flood forecasting; the basics of warning and response systems; watershed hydrology and management; and water quality. The impacts from snowmelt, ice jams and other events on flooding will be covered. Students will learn the basics of stormwater management, including Low Impact Development (LID) and green Infrastructure and the hydrologic design of stormwater management infrastructure. Students will learn common hydrologic modelling approaches through developing and applying HEC-HMS and SWMM 5, and how GIS can be applied in hydrology.
Instructor: Dr. M. M. Rahman

CIVL 8900-36: Special Topics: Road Safety Analysis
This course focuses on quantitative analysis and modeling of road safety. Topics include driver, vehicle, road geometric, traffic and environmental characteristics related to safety, motor vehicle crashes at road segments and intersections, crash risk and exposure, statistical methods, identification and evaluation of countermeasures, surrogate safety measures, and human factors of road safety.
Instructor: D. Shah

CIVL 8900-41/41A: Special Topics: Design Structure Using Canadian Codes & Modern Tools
This course covers the design of concrete and steel structures using modern software tools (STAAD.Pro). It builds knowledge on of analysis of various structures such as buildings and bridges. Students will gain proficiency in structural conceptualization and induced load determination, modeling and analysis. The course will cover also graphical communication. Approximate method of analyzing frames will be included to interpret and verify the output from computer-based structural analysis software. Students must have a computer with at least Windows 10, 2 GB RAM, 1 GB available hard drive space and dependable internet connection.
Instructor: Dr. W. Polies

CIVL 8900-42: Special Topics: Fundamentals of Environmental Engineering (see ENVE 8900-42)

CIVL 8900-44: Special Topics: Renewable Energy Systems
The course explores prominent and developing renewable energy technologies in a systems context. Energy systems infrastructure components and architectures are studied including centralized and decentralized grid topologies; select generation, transmission, distribution and storage assets will be examined. The fundamentals of energy markets and grid operations are considered including basic unit commitment dynamics and optimization. Offshore energy and energy storage solutions will be examined. Fundamental wind and solar energy design principles and essential battery, pumped hydro, flywheel and compressed air energy storage design considerations will be evaluated.
(Cross-listed with ENVE 8900-13)
Instructor: Dr. R. Carriveau

CIVL 8900-98: Sustainable Concrete Materials Systems
This course explores the multidisciplinary domain of concrete material systems, emphasizing the balance between high-performance requirements and sustainability objectives. It covers the entire spectrum from traditional concrete technology to innovative material design, ensuring that students are equipped with the knowledge to contribute to the development of sustainable infrastructure.
Instructor: Dr. A. Adesina

CIVL 8900-99: Pavement Materials, Design and Management
Fundamentals of pavement design, construction, and management for flexible and rigid pavements including pavement materials, application of traditional (Traffic Analysis for Pavement Design (ESAL), Standard Sections (RTAC Guide), AASHTO 93, Asphalt Institute method) and Mechanistic-Empirical pavement design (Pavement Stress and Strain, AASHTOWare Pavement ME Design) approaches, airport pavement design in Canada, introduction to Pavement Management Systems (PMS), sustainability aspects in pavement engineering (Lifecycle Cost Analysis and Lifecycle Assessment).
Instructor: Dr. G. Oyeyi

ENVE 8900-6: Special Topics: Climate Change Adaptation (see CIVL 8900-6)

ENVE 8900-12: Special Topics: Open Channel Flow (see CIVL 8900-15)

ENVE 8900-13: Special Topics: Renewable Energy Systems (see CIVL 8900-44)

ENVE 8900-31: Special Topics: Water Treatment & Reuse
Conventional water treatment systems. Disinfection requirements, technologies, and by-products. Membrane processes, advanced oxidation processes. Chemicals of emerging concern. Water reuse criteria and applications.
Instructor: Dr. S. Jasim

ENVE 8900-42: Special Topics: Fundamentals of Environmental Engineering
Introduction to pollutants, natural cycles, natural energy use, human population and consumption, common environmental problems, effects on human health. Dimensions of environmental contamination and flow. Pollution Prevention: waste audits, mass balances (open and closed systems, with and without chemical change), waste reduction, industrial ecology, and design for the environment. Conversion of energy and efficiency. Energy: world consumption, sources and their potential, environmental effects. Occupational health and safety. Environmental legislation. Sustainability.
(Cross-listed with CIVL 8900-42)
Instructor: Dr. L. Miller-Branovacki