CEE Graduate Course Descriptions – Summer 2023

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.
(Anti-requisite: CIVL 8900-50)
Instructor: Dr. R. Ruparathna

CIVL-8340: FRP Reinforced Concrete Structure
Advanced composite materials - constituents and products; structural applications, reinforced concrete members, prestressed concrete members, applications with chopped fibres, repair and rehabilitation; innovative applications.
Instructor: Dr. W. Tape

CIVL 8350: Wood Design
Introduction to structural wood design based on CSA O86 Engineering Design in Wood. Topics include: wood as an engineering material; sawn lumber; structural panels; connections; lateral-load resisting systems; glulam; and cross laminated timber.
Instructor: TBD

CIVL 8900-2: Project Planning and Control
Practical and theoretical applications to aid project planning and control in engineering projects. Understand advanced project management practices (e.g., earned value analysis, financial risk management), decision-making methods (e.g., multi-attribute decision-making methods, decision trees, optimization), and modeling techniques (e.g., Monte Carlo simulation, machine learning). Interpret and provide critical feedback on the intended project planning and control techniques.
Instructor: Dr. R. Ruparathna

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.
Instructor: Dr. Md M. Rahman

CIVL 8900-16: Special Topics: Bridge Engineering
Limit state design principles; structural forces within bridge structures; design requirements for prestressed members; relation between code requirements and practical design; CSA requirements for design; code requirements for design and assessment of bridge elements; detailed analysis and design of bridge systems; role of structural engineers and professional ethics responsibility.
Instructor: Dr. W. Tape

CIVL 8900-21: GIS Data Modeling
This course examines a range of advanced topics that are utilized to analyze and model spatial datasets with emphasis on transportation related problems. Key topics covered include: spatial data management, data representation and integration; data automation & model building; multi-criteria evaluation; site suitability; least-cost path analysis; network analysis; location-allocation problems; spatial statistics methods to explore and model spatial datasets (namely point events, continuous and area data); machine learning and big data analysis. The course follows a problem-solving based approach to study real world data in a GIS environment using contemporary GIS software (e.g., ArcGIS10.x).
Instructor: Dr. G. Vani

CIVL 8900-33: Special Topics: Advanced Masonry Design
Elements in masonry structures; experimental approach to testing masonry prisms, beams and walls; concept of Ultimate Limit State (ULS); masonry beam and masonry wall design (unreinforced and reinforced); load stress in different elements of masonry beams and walls; stability in masonry beams and walls; concept of general safety factor; computer software and design of masonry structural elements; basics of fine element modeling; ethical and professional responsibilities of a structural engineer.
Instructor: Dr. J. Zohrehheydariha

CIVL 8900-39: Foundation Engineering
Footings and eccentrically loaded foundations. Raft and pile foundations. Piles and pile driving, cofferdams and caissons. Soil-structure interaction. Computer-aided analysis and design of foundations. (Also offered as CIVL 4910-1)
Instructor: Dr. W. Polies

CIVL-8900-41: Special Topics: Design Str. Using Cdn 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 Windows 10 computer with at least 2 GB RAM, 1 GB available hard drive space and dependable internet connection.
Instructor: Dr. W. Polies

CIVL 8900-47: Special Topics: Design, Deterioration & Repair of Concrete
Design of concrete; normal concrete, high and ultra-high-performance concrete, self-compacting concrete, fibre reinforced cementitious composites, sprayable, and overlay cement based cementitious composites, textile fibre reinforced composites. Curing methods, long term performance, quality assurance (QA) and quality control (QC) of concrete materials. Relevant concrete materials specifications. Types and causes of concrete deterioration; errors during construction, scaling and disintegration, freeze-thaw, corrosion of embedded steel, cracking, shrinkage, chemical attack, alkali-silica reaction, spalling, erosion, effloresces, exposure to fire. Experimental and non-destructive testing. Repair of concrete; repair materials, repair techniques, challenges with conventional repair techniques, patch repair and materials compatibility with existing concrete, horizontal, vertical, and overhead repair methods.
Instructor: Dr. W. Tape

CIVL 8900-48: Special Topics: Intelligent Transportation Systems
This course will expose you to a range of modeling techniques used to represent the flow of vehicles. The course starts with macroscopic models which approximate vehicles as a continuous fluid; this is a major simplification but yields an elegant theory which has proven useful in practice. More detailed representations of vehicle flow, with brief coverage of vehicle dynamics and driver behavior will be covered. It will explore cellular automata and car-following models which treat vehicles as discrete entities. Then, the course moves toward to the basic concepts of transportation network analysis, as well as explore some applications. Basically, any problem which requires a "big-picture" view of what routes people will take relies on a network model. Finally, it will connect the traditional traffic and network models and Connected and Autonomous vehicles (CAVs) technologies to understand the future transportation systems.
Instructor: Dr. Y. H. Kim

CIVL 8900-59: Special Topics: Modular Construction, Design, and Technology
Introduction to modular construction; Types of modular building, Steel, timber, concrete; Planning of modular buildings; Hybrid modular construction systems; Structural design of steel and light steel modules; Structural design of concrete modules; Structural design of timber-framed modules; Cladding, roofing, and balconies in modular construction; Constructional issues in modular systems; Factory production of modules; Service interfaces in modular construction.
Instructor: Dr. H. Ghaednia

ENVE 8420: Air Pollution Modelling
Air quality standards; emission inventory, source estimation; development of transport models; models with chemical reactions.
Instructor: Dr. I. Xu

ENVE 8500: Sustainability: Principles & Practices
This course examines the evaluation, design, and management of products, processes, or projects to achieve sustainability. The main topics include assessing and scoping environmental effects from engineering and other technical activities; eco-balance approaches; life cycle assessment; design-for environment principles; and decision making for environmental and sustainability objectives. The course will discuss typical examples (e.g., automobiles, infrastructure, electronics), and draw upon the industrial and research experience and knowledge of the class attendees. Class-based projects will focus on understanding, interpreting, and implementing the knowledge acquired.
Instructor: Dr. L. Miller-Branovacki

ENVE 8900-4: Hydrogeological Engineering
Fundamental physics and properties of groundwater flow in porous geologic material; anisotropy, heterogeneity. Introduction to the theory of groundwater flow; groundwater flow equations and patterns, recharge and discharge, flow nets, aquifer pumping, two-phase flow and well hydraulics. Aquifer development and management. Introduction to chemical hydrogeology and non-aqueous phase liquids, Wellhead protection. Numerical modeling concepts.
(Also offered as ENVE 4820-1)
Instructor: Dr. T. Bolisetti

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