Environmental Engineering (ENVE)

Environmental Engineering (ENVE) Courses

ENVE 5004 [0.5 credit] (EVG 7144)
Advanced Wastewater Treatment
Fundamentals, applications, and design of biological, physical, and chemical treatment processes employed for advanced treatment of domestic and industrial wastewater. Reuse applications and guidelines.

ENVE 5007 [0.5 credit] (EVG 7101)
Filtration and Membranes in Water Treatment
Filtration is a key process for removal of contaminants from water sources. This course discusses various filtration processes including slow sand filtration, conventional filtration, biological filtration, and low and high pressure membrane applications in a lecture and seminar format. Previous water related course knowledge expected.

ENVE 5101 [0.5 credit] (EVG 7101)
Air Pollution Control
Air quality and pollution; definitions, measurement and monitoring methods. Criteria pollutants, air toxics, particulate matter, secondary pollutants. Pollutant formation mechanisms. Major sources and control methods. Meteorology and principles of dispersion modeling. Principles of receptor modeling. Indoor air quality.
Also offered at the undergraduate level, with different requirements, as ENVE 4003, for which additional credit is precluded.

ENVE 5105 [0.5 credit] (EVG 7105)
Atmospheric Aerosols
Atmospheric aerosol characterization and size distribution, theoretical fundamentals of physical and chemical processes that govern formation and transformation of aerosols in the atmosphere such as nucleation, coagulation, condensation/evaporation, and aerosol thermodynamics; interactions between aerosols and climate, aerosol sampling and measurement.

ENVE 5106 [0.5 credit] (EVG 7106)
Atmospheric Chemical Transport Modelling
Fundamentals of Eulerian atmospheric modelling; overview of global and regional atmospheric models, basic principles of numerical methods used in air quality models; applications of air quality models; uncertainty and sensitivity analysis in air quality modelling.

ENVE 5107 [0.5 credit] (EVG 7003)
Radiative Transfer and Remote Sensing
Exploration of interactions between light, Earth's surface, and the atmosphere. Topics include the radiative transfer equation, scattering and phase functions, and inverse theory. Applications to atmospheric science, climate, hydrology, and land use.

ENVE 5200 [0.5 credit] (EVG 7200)
Climate Change and Engineering
Survey of the physical science of climate change, impacts on the built environment, and climate adaptation in engineering. Greenhouse gases, global warming, paleoclimatology, and Earth system responses. Climate change impacts on structural, water, transportation, and energy systems. Climate vulnerability assessment, examples of design adaptation.
Also offered at the undergraduate level, with different requirements, as ENVE 4200, for which additional credit is precluded.

ENVE 5201 [0.5 credit] (EVG 7201)
Geo-Environmental Engineering
Landfill design; hydrogeologic principles, water budget, landfill liners, geosynthetics, landfill covers, quality control and quality assurance, clay/leachate interaction, composite liner design and leachate collection systems. Landfill operation, maintenance and monitoring. Design of environmental control and containment systems; slurry walls, grout curtains, Case studies.
Includes: Experiential Learning Activity
Also offered at the undergraduate level, with different requirements, as ENVE 4002, for which additional credit is precluded.

ENVE 5204 [0.5 credit] (EVG 7134)
Resource Industry Waste Management
Application of geotechnique and hydraulics to management of resource extraction residuals such as tailings, waste rock, and sludge from hard rock mines and bitumen extraction operations. Geotechnique of conventional and high density tailings disposal. Pipeline transport of concentrated suspensions. Closure technologies for mine waste impoundments.

ENVE 5205 [0.5 credit] (EVG 7132)
Sludge Treatment and Disposal
Aspects of sludge treatment, management, and disposal; sludge generation and characterization, thickening, preliminary treatment processes, aerobic and anaerobic digestion, lime stabilization, conditioning, dewatering, composting, land application and other disposal options, and thermal processes.

ENVE 5206 [0.5 credit]
Energy and Resource Recovery from Waste
Principles, design and application of biochemical and thermal processes for recovery of energy and value-added materials from different solid wastes and wastewater. Biochemical processes; biotransformation pathways, reactor analysis and chemical kinetics. Thermal treatment systems; process design, thermodynamics of material recovery.

ENVE 5301 [0.5 credit] (EVG 7301)
Contaminant Hydrogeology
Theory of flow through porous media; soil characterization, soil properties, anisotropy, heterogeneity. Contaminant transport. Well hydraulics and pump tests. Introduction to numerical modeling; finite difference, finite elements, conceptual model, boundary conditions. Site remediation and remediation technologies.
Also offered at the undergraduate level, with different requirements, as ENVE 4006, for which additional credit is precluded.

ENVE 5303 [0.5 credit] (EVG 7303)
Multiphase Flow in Soils
Theory of unsaturated flow and multiphase flow; capillary pressure-saturation relationships, relative permeability relationships, wettability, hysteresis, fluid entrapment, residual saturations, governing equations for flow and transport. Richard's Equation for unsaturated flow. Modeling of multiphase flow.

ENVE 5701 [0.5 credit] (EVG 7001)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses.

ENVE 5702 [0.5 credit] (EVG 7002)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses.

ENVE 5703 [0.5 credit] (EVG 7003)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses.

ENVE 5704 [0.5 credit] (EVG 7004)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses.

ENVE 5705 [0.5 credit] (EVG 7005)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses.

ENVE 5800 [0.0 credit] (EVG 5800)
Master's Seminar
M.A.Sc. and M.Eng (project option) students in the Environmental Engineering program are required to participate in these seminar series by attending all seminars and making at least one presentation during their graduate studies.
Registration in the course should be in the term that the presentation will take place.

ENVE 5900 [1.0 credit] (EVG 6001)
Environmental Engineering Project
Students enrolled in the M.Eng. program by project will conduct an engineering study, analysis, or design project under the general supervision of a member of the Department.
Includes: Experiential Learning Activity

ENVE 5906 [0.5 credit] (EVG 6108)
Directed Studies 1
Precludes additional credit for CIVE 5906.
Prerequisite(s): open only to students in an Environmental Engineering Master's program.

ENVE 5909 [2.5 credits] (EVG 7999)
Master's Thesis
Includes: Experiential Learning Activity

ENVE 6902 [0.0 credit]
Ph.D. Comprehensive Examination
Graduate students at the Doctoral level in the Environmental Engineering program are required to successfully complete a comprehensive examination which consists of a Ph.D. thesis proposal and successful defence of the proposal. Students should register in term they will defend their proposal.
Prerequisite(s): ENVE 6909 (taken concurrently).

ENVE 6906 [0.5 credit] (EVG 6109)
Directed Studies 2
Precludes additional credit for CIVE 6906.
Prerequisite(s): open only to students in the Environmental Engineering Ph.D. program.

ENVE 6909 [0.0 credit] (EVG 9999)
Ph.D. Thesis
Includes: Experiential Learning Activity

ENVE 7800 [0.5 credit] (EVG 5801)
Ph.D. Seminar
Ph.D. students in the Environmental Engineering program are required to participate in these seminar series by attending all seminars and making at least one presentation during their graduate studies.
Registration in the course should be in the term that the presentation will take place.