Environmental Engineering (ENVE)

Environmental Engineering (ENVE) Courses

ENVE 5001 [0.5 credit] (CVG 7160)
Biofilm Processes
Physical, chemical properties, microbial ecology of biofilms. Biofilm processes, attachment, growth, sloughing. Transport and interfacial transfer phenomena; mass transfer models, mass transport in biofilms, deposition of solids. Modeling biofilm systems; species models, mass balance equations, boundary conditions, moving boundary problem, analytical and numerical solutions.

ENVE 5003 [0.5 credit] (EVG 7143)
Advanced Ultraviolet Processes
Fundamentals and applications of ultraviolet (UV) light-based processes for water and wastewater treatment; principles of photochemistry and photobiology, methods of UV dose determination, UV disinfection of microorganisms, advanced oxidation processes, and design of UV disinfection systems and reactors.

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 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 5102 [0.5 credit] (CVG 7161)
Traffic-Related Air Pollution
Pollutant formation, emission characterization, emission control technology and emission modeling from motor vehicles. Dispersion and receptor modeling for conservative pollutants in urban microenvironments. Personal exposure and health risk assessment.

ENVE 5103 [0.5 credit] (CVG 7162)
Air Quality Modeling
Dispersion modeling for simple and complex sources and complex terrain. Physical and chemical transformations for pollutants in the atmosphere. Urban and regional air pollution modeling for reactive pollutants. The urban air shed model. Regional air quality modeling case studies.

ENVE 5104 [0.5 credit] (EVG 7104)
Indoor Air Quality
Indoor air quality as a component of the indoor environment; physical and chemical parameters for characterization. Types and sources of indoor air pollution, measurement techniques. Heating, ventilation, and air conditioning practices and issues. The human factor in identifying and controlling indoor air pollution.

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 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.
Also offered at the undergraduate level, with different requirements, as ENVE 4002, for which additional credit is precluded.

ENVE 5202 [0.5 credit] (EVG 7202)
Contaminant Fate Mechanisms
Mechanisms and chemical properties influencing the fate of toxic contaminants in environmental systems; liquid-gas partitioning and mass transfer, liquid-solid partitioning, abiotic and biotic degradation of toxics. Fate of toxics in wastewater collection and treatment systems. Treatment of residual streams; sludges, air streams. Mechanisms influencing the fate of toxic contaminants in aquatic and subsurface environments.

ENVE 5203 [0.5 credit] (EVG 5203)
Hazardous and Radioactive Wastes
Classification of hazardous, radioactive and mixed wastes, hazardous waste treatment processes, wastes generated in the nuclear fuel cycle, radioactive waste classification, radioactive waste treatment and management of residuals, engineered systems for long-term isolation and disposal, mixed waste management.
Also offered at the undergraduate level, with different requirements, as ENVE 4101, 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 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 5302 [0.5 credit] (CVG 7163)
Case Studies in Hydrogeology
Development of a conceptual model; chemistry, geology and hydrology, site characterization, initial and boundary conditions. Application of industry-recognized computer codes to model flow and contaminant transport at a particular site. Evaluation of remedial alternatives at a site. Modeling of the more common remediation technologies (soil vapour extraction, air sparging, pump and treat, biodegradation).

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 5401 [0.5 credit] (EVG 7401)
Environmental Impacts of Major Projects
Regulatory framework and impact assessment requirements for project approvals, survey of the components of the EIA process and methodology, the review process, public participation in environmental decision-making, preparation of the EIA document, case studies of major engineering projects.

ENVE 5402 [0.5 credit] (EVG 7402)
Finite Elements in Field Problems
Use of Galerkin and Ritz finite element formulations to solve one and two dimensional field problems. Steady state and time-dependent phenomena involving heat transfer, fluid flow, diffusion, and dispersion with emphasis on practical applications. Basic knowledge of third year-level undergraduate engineering mathematics and physics required.
Also listed as CIVE 5107.

ENVE 5701 [0.5 credit] (EVG 6301)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5702 [0.5 credit] (EVG 6302)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5703 [0.5 credit] (EVG 6303)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5704 [0.5 credit] (EVG 6304)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5705 [0.5 credit] (EVG 6305)
Topics in Environmental Engineering
Courses in special topics in environmental engineering not covered by other graduate courses; details will be available some months prior to registration.

ENVE 5800 [0.0 credit] (EVG 7305)
Master's Seminar
The series consists of presentations by graduate students or external speakers. Graduate 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.

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

ENVE 5906 [0.5 credit] (EVG 6108)
Directed Studies 1
Precludes additional credit for CIVE 5906.

ENVE 5907 [0.5 credit] (EVG 6109)
Directed Studies 2
Precludes additional credit for CIVE 5907.

ENVE 5909 [3.0 credits] (EVG 7999)
Master's Thesis

ENVE 6909 [8.5 credits] (EVG 9999)
Ph.D. Thesis

ENVE 7800 [0.0 credit] (EVG 6109)
Ph.D. Seminar
The series consists of presentations by graduate students or external speakers. Graduate 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.

Summer session: some of the courses listed in this Calendar are offered during the summer. Hours and scheduling for summer session courses will differ significantly from those reported in the fall/winter Calendar. To determine the scheduling and hours for summer session classes, consult the class schedule at central.carleton.ca

Not all courses listed are offered in a given year. For an up-to-date statement of course offerings for the current session and to determine the term of offering, consult the class schedule at central.carleton.ca