

ENVIRONMENTAL ENGINEERING (ENVE)

ENVE F446 Biological Unit Processes

3 Credits

Offered Spring Even-numbered Years

Theoretical and applied aspects of biological wastewater treatment, including waste-activated sludge processes, trickling filters, lagoons, sludge digestion and processing, nutrient removal, biology of polluted waters, state and federal regulations.

Prerequisites: MATH F302.

Recommended: CE F341.

Stacked with ENVE F646.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F641 Aquatic Chemistry

3 Credits

Offered As Demand Warrants

Chemistry of aquatic systems, including the development of equilibrium and kinetic models to understanding the speciation, transformation and partitioning of inorganic chemical species in aqueous systems. Emphasis is on the study of acid-base chemistry, complexation, precipitation-dissolution and reduction-oxidation reactions.

Prerequisites: Graduate standing.

Cross-listed with CHEM F605.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F642 Contaminant Hydrology

3 Credits

Offered Spring Odd-numbered Years

Theoretical and applied aspects of the movement of contaminants through saturated and unsaturated soil.

Recommended: CE F663 or equivalent; graduate standing; or permission of instructor.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F643 Air Pollution Management

3 Credits

Offered Spring

Major principles and problems associated with air quality, stationary and moving sources, air pollution effects; major air pollution legislation and compliance calculations; meteorology and modeling of pollutant concentrations near a source; greenhouse gas emissions and climate change; control equipment and design of control strategies for specific air pollution problems. Prerequisites: CHEM F106X; graduate standing.

Prerequisites: Recommended: MATH F252X.

Stacked with CE F443.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F644 Environmental Management and Permitting

3 Credits

Offered Spring Odd-numbered Years

Topics of environmental impact statements, environmental law (local, state and federal), public involvement and environmental quality. Impact from projects of mining, highways, airports, pipelines, industrial development, water, wastewater and solid waste, and others—theoretical considerations and case studies.

Recommended: Graduate standing or permission of instructor.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F645 Unit Processes: Chemical and Physical

3 Credits

Offered Fall Odd-numbered Years

Theory and design of chemical and physical unit processes for water and wastewater. Sedimentation, coagulation, flocculation, filtration, ion exchange, adsorption/absorption, gas transfer and other special topics. Emphasis on Arctic applications and design.

Recommended: MATH F252X; CHEM F106X or equivalent; graduate standing; or permission of instructor.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F646 Biological Unit Processes

3 Credits

Offered Spring Even-numbered Years

Theoretical and applied aspects of biological wastewater treatment, including waste-activated sludge processes, trickling filters, lagoons, sludge digestion and processing, nutrient removal, biology of polluted waters, state and federal regulations.

Prerequisites: Recommended: Graduate standing.

Stacked with ENVE F446.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F647 Biotechnology

3 Credits

Offered Fall Even-numbered Years

Theoretical and applied aspects of bioengineering. Issues studied include microbiology, metabolism, genetics, genetic engineering, enzymes and catalysis, stoichiometry and kinetics, biological reactor design and bioremediation.

Recommended: Graduate standing or permission of instructor.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F649 Hazardous and Toxic Waste Management

3 Credits

Offered Fall Odd-numbered Years

Course provides in-depth coverage of hazardous and toxic substance management including legal, economic and technical issues. Topics will include characterization of hazardous materials, economics of toxics minimization, hazardous materials use, storage and disposal, basics of municipal solid waste and technical aspects of landfill siting, and selection and design of treatment technologies. Includes case studies of current waste management issues.

Recommended: Bachelor's degree in science or engineering.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F651 Environmental Risk Assessment

3 Credits

Offered Spring Odd-numbered Years

The characterization of population exposures and the evidence used to identify environmental substances that may pose a human health risk. The theory and methods for estimating risk: hazard identification, dose-response assessment, exposure assessment and risk characterization.

Recommended: Undergraduate degree in engineering or natural science.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F652 Introduction to Toxicology for Engineers and Scientists

3 Credits

Offered Fall Even-numbered Years

Introduction to the science of toxicology for graduate students in fields that use information about hazardous chemicals for input into decisions. Topics include an overview of the effects of chemicals on cells, organs and organ systems, and the toxic effects of classes of chemicals such as pesticides, metals and solvents. Use of data from animal testing and common lists, factors and extrapolation are reviewed.

Recommended: Undergraduate degree in engineering or natural science.

Lecture + Lab + Other: 3 + 0 + 0

ENVE F653 Environmental Measurements Laboratory

1 Credit

Offered Spring

Introduction to analytical methods and measurement techniques used in environmental engineering and environmental quality science. Students will design, conduct and report on a laboratory experiment. Includes sample preparation techniques and analytical methods such as microscopy, atomic adsorption spectroscopy, gas chromatography, liquid chromatography and mass spectrometry.

Recommended: ENVE F641.

Lecture + Lab + Other: 0 + 3 + 0

ENVE F698 Non-thesis Research/Project

1-9 Credits

Lecture + Lab + Other: 0 + 0 + 1-9

ENVE F699 Thesis

1-12 Credits

Lecture + Lab + Other: 0 + 0 + 1-12