ENVE-ENVIRONMENTAL ENGINEERING

ENVE 450. Aquatic Chemistry
3 Credits (3)
Theoretical aspects of physical chemistry applied to the solution of environmental engineering problems. Emphasis on acid-base reactions, precipitation-dissolution reactions, complexation, and redox reactions. Same as ENVE 550.
Prerequisite: C- or better grade in C E 256.
Learning Outcomes
1. Students will be able to use fundamental principles of physical chemistry as applied to acid-base, precipitation-dissolution, complexation, and redox reactions to determine the composition of waters, including natural waters and waters encountered in water and wastewater treatment processes.

ENVE 451. Unit Processes/Operation of Water Treatment
3 Credits (3)
Theory and applications of unit processes in environmental engineering. Physical and chemical water treatment methods are emphasized. Crosslisted with: ENVE 551.
Prerequisite: C- or better grade in C E 356.
Learning Outcomes
1. Students will be able to use fundamental reactor design principles to design unit operations for water treatment, including sedimentation, coagulation, flocculation, filtration, and disinfection.

ENVE 452. Unit Processes/Operation of Wastewater Treatment
3 Credits (3)
Theory and applications of unit processes in environmental engineering. Biological wastewater treatment methods are emphasized. Crosslisted with: ENVE 552.
Prerequisite: C- or better grade in C E 356.
Learning Outcomes
1. Students will be able to use fundamental reactor design principles to design unit operations for wastewater treatment, including sedimentation, aerobic and anaerobic microbial treatment, and disinfection.

ENVE 456. Environmental Engineering Design
3 Credits (3)
Design of chemical, physical, and biological operations and processes involved in water and wastewater treatment. Student can also be a graduate student to enroll if they have not completed C E 356.
Prerequisite: C- or better grade in C E 356.
Learning Outcomes
1. Students will be able to incorporate knowledge from previously taken engineering design and economics courses to complete an environmental design and solve a real world problem.
2. Students will be able to communicate and explain their solution approach to a variety of audiences using different communication methods.

ENVE 459. Environmental Microbiology
3 Credits (3)
An introduction to the diverse roles of microorganisms in natural and engineered environments. The topics include cellular architecture, energetics, and growth; population and community dynamics; water and soil microbiology; biogeochemical cycling; and microorganisms in biodegradation and bioremediation of contaminants. Students must be a Senior or in Graduate Standing to enroll.
Learning Outcomes
1. Students will be able to demonstrate the significance of microbial processes in natural and engineered processes.

ENVE 487. Air Pollution Control Systems Design
3 Credits (3)
An introduction to sources and nature of air pollution, regulations, and risk analysis. Detailed study of air pollution control technologies and design of air pollution control equipment. Students must be a Senior or in graduate standing to enroll.
Learning Outcomes
1. Students will be able to explain the source and nature of air pollution.
2. Students will be able to relate air pollution to regulations using a risk analysis approach.
3. Students will be able to design air pollution control systems.

ENVE 504. Advanced Environmental Engineering Design
3 Credits (3)
Advanced engineering design covering the subject matter of the Environmental Engineering capstone undergraduate design course plus an additional report or project. May be subtitled. Consent of instructor required.
Learning Outcomes
1. Students will be able to incorporate knowledge from previously taken engineering design and economics courses to complete an environmental design and solve a real world problem.
2. Students will be able to communicate and explain their solution approach to a variety of audiences using different communication methods.

ENVE 550. Aquatic Chemistry
3 Credits (3)
Theoretical aspects of physical chemistry applied to the solution of environmental engineering problems. Emphasis on carbonate equilibria solubility, buffering and redox conditions. May be repeated up to 3 credits. Consent of Instructor required. Crosslisted with: ENVE 450.
Prerequisite(s): C E 256.

ENVE 551. Unit Processes/Operation of Water Treatment
3 Credits (3)
Theory and applications with unit processes in environmental engineering. Physical / chemical treatment methods emphasized. May be repeated up to 3 credits. Crosslisted with: ENVE 451.
Prerequisite(s): C E 356.

ENVE 552. Unit Processes/Operation of Wastewater Treatment
3 Credits (3)
Theory and applications with unit processes in environmental engineering. Biological treatment methods emphasized. May be repeated up to 3 credits. Crosslisted with: ENVE 452.
Prerequisite(s): Consent of instructor.

ENVE 556. Advanced Water Treatment and Reuse
3 Credits (3)
Overview of both the theoretical and practical aspects of advanced water treatment technologies and water reuse applications. Basic design features of the processes are presented, with emphasis on the underlying principles, including why and how a process works, what the significant variables are, and what the limitations of the process are. Problem solving skills and technical communication skills are emphasized.
Prerequisite: ENVE 551.

Learning Outcomes

1. Students will be able to design advanced water treatment processes, including membrane filtration, electrodialysis, ion exchange, advanced oxidation, photolysis, and distillation.
2. Students will gain knowledge in water reuse applications including water quality criteria, regulations, and implementation issues.

ENVE 557. Surface Water Quality Modeling
3 Credits (3)
Modeling the impacts of waste disposal practices on surface waters. Emphasis on fate and transport of bacteria, dissolved oxygen, nutrients, and toxicants in rivers, lakes, and tidal waters. Students must be in Graduate standing to enroll.

Learning Outcomes

1. The students will be able to use mathematical models to model the transport of constituents important for water quality, such as bacteria, viruses, nutrients, contaminants, and oxygen, in aqueous environments.

ENVE 598. Special Research Programs
1-3 Credits
Individual investigations either analytical or experimental. May be repeated up to 6 credits.

Learning Outcomes

1. Students will develop knowledge related to the specific environmental engineering special topic selected for research.

ENVE 599. Master's Thesis
15 Credits
Thesis. May be repeated up to 88 credits.

Learning Outcomes

1. Students will progress toward completion of their research thesis.

ENVE 630. Fate and Transport of Environmental Contaminants
3 Credits (3)
Modeling of transport phenomena in natural and engineered systems for predicting the fate of contaminants in the air, soil, sediment, and water compartments of the ecosystem.
Prerequisite: ENVE 557.

Learning Outcomes

1. The students will be able to use mathematical models to model the transport of contaminants in gas, aqueous, and soil environments.