ENVIRO NMENTAL ENGI NEERING

Department of Civil and Environmental Engineering
College of Engineering

280 Principles of Environmental Engineering and Science
Fall, Spring. 3(3-0) Interdepartmental with Civil Engineering. Administered by Environmental Engineering. P: (CEM 141 or CEM 151 or LB 171) and ((MTH 132 or concurr- rently) or (MTH 152H or concurrently)) or (LB 110 or concurrently)
Physical, chemical and biological processes related to environmental science and engineering. Environmental systems analysis with application to air, water and soil. Analysis of environmental problems and de- velopment of engineering solutions.

421 Engineering Hydrology
Fall. 3(3-0) Interdepartmental with Civil Engineering. Administered by Environmental Engineering. P: CE 321 and (GLG 201 or GLG 301) R: Open to juniors or seniors or gradu- ate students in the College of Engineering or in the College of Natural Science or in the Department of Plant, Soil and Microbial Sci- ences.
Hydrologic design of storm water systems. Equilib- rium hydrograph analysis, unit hydrographs, infiltra- tion, hydrograph synthesis, and reservoir routing.
Groundwater: Darcy’s law, flow nets, well hydraulics, design of capture wells.

422 Applied Hydraulics
Spring. 3(2-2) Interdepartmental with Civil Engineering. Administered by Environmental Engineering. P: CE 321 or ME 332 R: Open to juniors or seniors or graduate students in the College of Engineering.

480 Environmental Measurements Laboratory
Fall. 1(0-3) Interdepartmental with Civil Engineering. Administered by Environmental Engineering. P: (CEM 161 or CEM 185H or LB 171L) and ENE 280 R: Open to juniors or seniors or graduate students in the College of Engineering.
Basic chemical and microbiological methods used in the analysis of environmental media. Laboratory safety, quality assurance, quality control, and statis- tics used in laboratory analysis. Related technical communication, laboratory report writing.

481 Environmental Chemistry: Equilibrium Concepts
Fall. 3(3-0) Interdepartmental with Civil Engineering. Administered by Environmental Engineering. P: ((CEM 141 and CEM 142) or (CEM 151 and CEM 152)) or (CEM 181H and CEM 182H) or (LB 171 and LB 172)) and (ENE 280 or BE 230 or GLG 201 or GLG 301 or approval of department)
Chemistry of natural environmental systems and pol- lutants. Equilibrium concepts and calculations for acid-base, solubility, complexion, redox and phase partitioning reactions and processes. Applications to ecosystem analysis, pollutant fate and transport, and environmental protection.

483 Water and Wastewater Engineering
Fall. 3(3-0) Interdepartmental with Civil Engi- neering. Administered by Environmental Engineering. P: (ENE 280 or BE 230) and (CE 321 or CHE 311) R: Open to juniors or seniors or graduate students in the College of Engineering.
Engineering and scientific basis and design of physi- cal, chemical and biological methods for the treat- ment of drinking water and wastewater. Operation process selection and design.

485 Landfill Design
Spring. 3(3-0) Interdepartmental with Civil Engineering. Administered by Civil Engineering. P: ENE 280 and CE 312
Geotechnical and environmental design of solid waste landfills.

487 Microbiology for Environmental Science and Engineering
Spring. 3(3-0) Interdepartmental with Civil Engineering. Administered by Environmental Engineering. P: ENE 280
Fundamentals of microbiology. Application of these concepts to environmental processes such as wastewater treatment, human health and bioremedi- ation.

489 Air Pollution: Science and Engineering
Spring. 3(3-0) Interdepartmental with Civil Engineering. Administered by Environmental Engineering. P: (CEM 141 or CEM 151 or LB 171) and (MTH 133 or MTH 153H or LB 119) and (ENE 280 or BE 230) and (CE 321 or CHE 311) R: Open to juniors or seniors or graduate students in the College of Engineering.
Basic physical and chemical principles governing indoor and atmospheric air pollution. Elements of air pollution meteorology, climate change, atmospheric transformations and transport. Air pollution sources and methods for their control. The role of local, state and federal government in air pollution control.

490 Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of depart- ment.
Environmental engineering problem of specific inter- est to the student and a faculty member. May be analysis or design.

492 Selected Topics in Environmental Engineering
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of depart- ment.
Selected topics related to environmental engineer- ing, fluid mechanics and hydrology.

800 Environmental Engineering Seminar
Fall, Spring. 1(1-0) R: Open only to Environ- mental Engineering majors.
Current research in environmental engineering.

801 Dynamics of Environmental Systems
Spring. 3(3-0)
Principles of mass balance, reaction kinetics, mass transfer, reactor theory in environmental engineering.

802 Physical-chemical Processes in Environmental Engineering
Fall. 3(3-0) R: ENE 801
Physical and chemical principles of air and water pol- lution control and environmental contaminants in wa- ter, air and soils.

803 Water Quality and Public Health
Spring of odd years. 3(3-0)

804 Biological Processes in Environmental Engineering
Fall. 3(3-0) R: ENE 801 or concurrently
Engineering of microbial processes used in wastewater treatment, in-situ bioreclamation, and solid waste stabilization.

805 Contaminated Site Remediation
Spring of odd years. 3(3-0)
Undergraduate classes in environmental engineering.

806 Environmental Engineering Process Laboratory
Spring. 3(2-4) R: ENE 480 and ENE 802 and ENE 804 R: Open to graduate students in the Environmental Engineering major.
Development of skills related to planning, design, and execution of processes related to environmental en- gineering, enhance decision making skills, teamwork, analysis of data, report writing, and oral presentation.

811 Membrane Processes
Spring of odd years. 3(3-0) R: (CE 321 or concurrently) and Calculus through differen- tial equations, Physical chemistry
Fundamental principles and applications of mem- brane processes in environmental engineering, em- phasizing solid-liquid separations and pressure- driven membrane systems.

821 Groundwater Hydraulics
Fall. 3(3-0) Interdepartmental with Civil Engi- neering. Administered by Environmental En- gineering.

822 Groundwater Modeling
Spring of even years. 3(3-0) Interdepart- mental with Civil Engineering. Administered by Environmental Engineering.
823  **Stochastic Groundwater Modeling**  

829  **Mixing and Transport in Surface Waters**  

861  **Introduction to Risk and Reliability in Civil and Environmental Engineering**  
Fall. 1(1-0) Interdepartmental with Civil Engineering. Administered by Civil Engineering. Not open to students with credit in CE 810. Characterization of variability using probabilistic and statistical methods.

880  **Independent Study in Environmental Engineering**  
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Environmental Engineering majors. Solution of environmental engineering problems not related to student's thesis.

890  **Selected Topics in Environmental Engineering**  
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open to students in the Environmental Engineering major. Selected topics in new or developing areas of environmental engineering.

892  **Master's Research Project**  
Fall, Spring. Summer. 1 to 5 credits. A student may earn a maximum of 5 credits in all enrollments for this course. R: Open only to master's students in the Environmental Engineering major. Approval of department. Master's degree Plan B individual student research project. Original research, research replication, or survey and reporting on a research topic.

899  **Master's Thesis Research**  
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course. Master's thesis research.

900  **Research Strategies and Methods in Environmental Engineering and Science**  
Spring. 1(1-0) Interdepartmental with Geological Sciences. Administered by Environmental Engineering. R: Open to graduate students in the Department of Civil and Environmental Engineering and open to graduate students in the Department of Geological Sciences. Not open to students with credit in CE 900 Criteria for quality research, scientific method, scientific arguments, statistical testing, critical thinking skills, reviewing journal articles, literature synthesis, writing proposals and papers, giving presentations, responsible conduct of research.

999  **Doctoral Dissertation Research**  
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course. Doctoral dissertation research.