Environmental Engineering (EVEN)

EVEN 5303 Advanced Topics in Environmental Engineering **1-3 SCH (1-3)**
One or more advanced topics. May be repeated for credit when topic changes.

EVEN 5305 Graduate Research Project **3 SCH (3)**
Designed for project option students and requires completion of research project. Prerequisite: departmental approval. May be repeated for a maximum of 6 semester hours.

EVEN 5306 Thesis **3 SCH (3)**
For thesis option students. The course requires 6 hours of grades, the first 3 hours consisting of completion of a thesis proposal and the last 3 hours consisting of completion of the thesis. Completion of the thesis proposal is a prerequisite for enrollment in the last 3 hours of thesis.

EVEN 6102 Grad Sem in Environmental Eng **1 SCH (0-1)**
Provides students with exposure to multidisciplinary opinions on current and future environmental issues from industrial, scientific, academic, governmental and engineering experts, in an environment that fosters productive exchange of ideas. Prerequisite: graduate standing in EVEN or related discipline. Credit/Noncredit.

EVEN 6301 Environ and Occupationl Health **3 SCH (3-0)**
Overview of pertinent regulations and regulatory infrastructure. Development and application of the fundamental principles that determine environmental and occupational health. Discussion of methods for controlling environmental occupational hazards. Introduction to Environmental Health and Safety Information Systems.

EVEN 6304 Internship in Environ Eng **1-3 SCH (1-3)**
Allows environmental engineering graduate students to participate in internships with industry, government and environmental consulting companies in career-based practical activities to broaden the skills obtained through curricular education. Attention will be given to select opportunities where the job training enhances the particular research needs of each student. Credit/Noncredit.

EVEN 6306 Proposal/Dissertation Research **1-3 SCH (0-0-1-3)**
Students are allowed no more than 6 hours of registrations to complete a dissertation proposal.

EVEN 6308 Fundmnls Solid Hazardous Waste **3 SCH (3-0)**
Overview of pertinent federal and state regulations. Fundamentals of solid/hazardous waste generation, management, treatment and disposal. Emphasis on the modeling aspects of the fate and transport of hazardous waste in the environment. Discussions of assessment planning, waste minimization, effective management of waste material and the application of treatment and disposal technologies.

EVEN 6309 Fundmnls Air Qual&Polutn Contr **3 SCH (3-0)**
Classification of air pollutants by the Clean Air Act and its amendments. Fundamental theories of air pollution and atmospheric science. Air pollution meteorology, atmospheric dispersion modeling and an introduction to air quality models. Control technology of gaseous air pollutants, process design variables applications.

EVEN 6311 Air Quality Modeling **3 SCH (3-0)**
Physico-chemical process analysis of the atmosphere. Discussion of air quality models, types and applications. Development of an atmospheric chemical transport model for urban and regional scale applications. Performance evaluation and statistical assessment of air quality models. Stochastic modeling and analysis of air quality problems. Student's basic knowledge of differential equations is recommended.

EVEN 6312 Surface Water Quality Modeling **3 SCH (3-0)**
Ecological and human effects assessment; environmental decision criteria; monitoring strategies; environmental exposure assessment; development of pollutant transport, fate and persistence models; model parameter estimation. Student's basic knowledge of differential equations is recommended.

EVEN 6313 Groundwater Contamin Transport **3 SCH (3-0)**
Advanced topics in groundwater flow problems and contaminant transport modeling, including groundwater transport model selection, initialization and calibration with an emphasis on model application to regional water resources protection and planning. Student's basic knowledge of differential equations is recommended.

EVEN 6316 Fundmnls of Environ Biotech **3 SCH (3-0)**
Overview of microbiology fundamentals and development of quantitative tools for describing stoichiometry, microbial energetics, microbial kinetics, biofilm kinetics and bioreactor mass balances. Application of these tools for designing processes for treating solid, liquid and gas phase pollutants, including solid waste composting, wastewater treatment, sludge digestion, bioremediation and air biofiltration. Analysis of complex biological systems involving dynamic multispecies interactions.

EVEN 6318 Environmental System Modeling **3 SCH (3-0)**
Designed to introduce the basic approaches for modeling environmental systems. Impacts from anthropogenic activities to the environment will be systematically evaluated via the use of various simulation approaches. Case studies in understanding complex environmental systems will be incorporated to enhance the integrated skills available for model synthesis via multidisciplinary analysis. Student's basic knowledge of differential equations is recommended.

EVEN 6319 Chem Prin of Envir Eng Design **3 SCH (3-0)**
Discussions and applications of chemical principles in disinfection, air pollution, geochemistry and aquatic, microbial, redox and coagulation chemistry in systems design for environmental engineering. Introduction to chemical computer models for environmental applications. An overview of the biogeochemistry of natural water systems and the chemistry of the atmosphere.

EVEN 6325 Physical-Chem Water Treatment **3 SCH (3-0)**
Overview of the theory and mechanisms governing physical and chemical water treatment processes. Application of chemical and physical process theory to the practical design of systems for water and wastewater treatment and residuals management. Basic design features of the treatment systems are presented, with an emphasis on the underlying principles. Prerequisite: graduate standing.

EVEN 6329 Environ Monitor and Measurmnts **3 SCH (1-3)**
An integrated experience in developing and designing laboratory experiments and field sampling campaigns, acquiring and analyzing high quality data for understanding environmental phenomena and presenting experimental results using state-of-the-art communication tools. Emphasis is also on project-oriented, team-based projects that promote collaborative learning.

EVEN 6332 Environmental Data Analysis **3 SCH (3-0)**
Topics concerning the unique characteristics of environmental data, the process of statistical characterization, the identification of system changes, the usefulness of non-parametric approaches and the utilization of data in characterizing risk and designing effective environmental experiments and sampling plans. Student's basic knowledge of differential equations is recommended.

EVEN 6340 Decision Sci for Environ Systm **3 SCH (3-0)**
Provides the fundamentals of decision science theory in support of large-scale complex environmental systems analysis. Discussions and lectures will cover the realm of multi-criteria decision-making. The basics of multi-attribute decision-making and multi-objective stochastic programming, gray programming, fuzzy programming and their combinations will be emphasized.

EVEN 6341 Enviromental Informatics **3 SCH (3-0)**
Introduction to Linux and python programing to use, manipulate, and handle large environmental datasets using High Performance Computing (HPC) resources. Discussion on different data types, various data visualization platforms, data quality checking techniques, working with missing data and distributed computer models, and generating high quality spatial maps, as well as analyzing geospatial data.

EVEN 6342 Enginerng Optimzatn Envron Sys **3 SCH (3-0)**
Provides the fundamentals of optimization theories and their real world application potential for environmental systems planning and pollution control. Class discussions of fundamental operational research techniques cover linear programming, integer programming, dynamic programming and nonlinear programming. Case studies are designed to deal with the typical planning, design and operation problems for environmental infrastructure systems with regard to complex multidisciplinary decision-making.

EVEN 6345 Environmtl Sustain&Resilience **3 SCH (3-0)**
This course focuses on current global environmental sustainability and resilience issues including climate change, earth systems and human activities, sustainable infrastructure and development, and resilience concepts, strategies, and practices. It also introduces basic scientific methods, data analysis and communication tools for promoting environmental sustainability and resilience.

EVEN 6347 Data Science for Next Generation of Community Researchers **3 SCH (3)**
This course focuses on providing hands-0n experience and fundamental knowledge f data science processes, data analysis skills, and rapid ethnograhic assessment for transdisciplinary solutions to environmental issues and challenges. It has two component parts: data science fundamentals and qualitative informatics. Data science fundamentals includes data and simulation driven research and problem solving, statistical and exploratory data analysis using R and Python, data formats acquisition and cleaning, cyberinfrastructure systems for data integration, data visualization, machine learning and ethical issues in data science. Qualitative informatics includes research methods central to stakeholder engagement, mixed methodological research design, and qualitative data analysis including keeping fieldnotes, memoing, coding, and interpretation.

EVEN 6349 Grad Prof Skills Developmt Lab **3 SCH (3-0)**
This course focuses on the development and enhancement of graduate students' skills and competencies in communication, teamwork, ethics, and leadership for transdisciplinary community engagement and research. Skill highlights include intercultural competencies in communication, academic writing, oral professional presentations, culturally sustainable interactions, developmental stages of individual and organizational growth, the role of ethics across diverse careers, accountability in research conduct, financial literacy, and project management and leadership.

EVEN 6354 Environmental Regs & Policy **3 SCH (3-0)**
Overview of federal and state regulations and international agreements for the protection of human and environmental health. Legal, social, political and economic patterns and processes, which set the stage for the development of environmental policy. Impacts and interactions of environmental regulation and policy on the design and implementation of environmental management systems in the public and private sectors. Discussion of environmental ethics and interactions with the environmental engineering profession and with the formulation of environmental regulations and policy.

EVEN 6356 Spec Top in Environmental Eng **3 SCH (3-0)**
Courses offered under this Special Topics denomination concentrate on themes not present in the current EVEN curriculum, or can also be offered to strengthen and provide further depth of study in important areas of environmental engineering. Topics vary to reflect new developments and interests on emerging areas of environmental engineering. May be repeated when topic changes.