# Environmental Science and Engineering (EVSE)

## COURSES

**EVSE 5100. SELECTED TOPICS IN ENVIRONMENTAL SCIENCE AND ENGINEERING. 1 Hour.**
May be repeated for credit when topic changes.

**EVSE 5115. PROFESSIONAL EXPERIENCE. 1 Hour.**
Work in environmental science for a commercial concern at least 20 hrs/wk for 3 months. Requirements include writing a resume, learning how to interview and function on the job, and a report describing the work. Prerequisite: Cons. inst.

**EVSE 5120. ENVIRONMENTAL PROFESSIONAL MENTORING & BUSINESS ETHICS. 1 Hour.**
Provides credit to students participating in an approved mentoring program with an experience environmental professional. May be repeated once for credit.

**EVSE 5199. SEMINAR IN ENVIRONMENTAL & EARTH SCIENCES. 1 Hour.**
Topics presented by faculty, students, and invited lecturers.

**EVSE 5200. SELECTED TOPICS IN ENVIRONMENTAL & EARTH SCIENCES. 2 Hours.**
May be repeated for credit when topic changes.

**EVSE 5294. INDIVIDUAL PROBLEMS IN ENVIRONMENTAL & EARTH SCIENCES. 2 Hours.**
Individual research projects supervised by a faculty member.

**EVSE 5300. SELECTED TOPICS IN ENVIRONMENTAL & EARTH SCIENCE. 3 Hours.**
May be repeated for credit when topic changes.

**EVSE 5303. SUSTAINABILITY ISSUES SEMINAR III. 3 Hours.**
Governmental and regulatory issues as they relate to sustainability.

**EVSE 5309. ENVIRONMENTAL SYSTEMS-BIOLOGICAL ASPECTS. 3 Hours.**
An introduction to the biological components of environmental systems. Population dynamics, species interactions, community structure, biodiversity, bioenergetics, nutrient cycling and human impacts are reviewed. Focus will be on natural processes and their engineering applications.

**EVSE 5310. ENVIRONMENTAL SYSTEMS-CHEMICAL ASPECTS. 3 Hours.**
An introduction to the chemistries of air at different altitudes, of water systems and of soils. Chemical and physico-chemical processes at phase boundaries, modeling for kinetics and mass transport, analytical techniques and disposal and recycling are included as well as their impact on engineering decisions.

**EVSE 5311. ENVIRONMENTAL SYSTEMS-GEOLOGICAL ASPECTS. 3 Hours.**
Introduction to the tectonic, volcanic, atmospheric, climatic, hydrologic and geochemical processes and natural hazards of the earth, and their interaction with political, economic and engineering decisions.

**EVSE 5312. ENVIRONMENTAL RISK BASED ACTION. 3 Hours.**
This course offers an introduction to environmental risk-based actions including environmental laws and regulations, hazard identification, toxicology, common contaminants, chemical intake models, chemical fate and transport models, and vapor intrusions.

**EVSE 5313. ENVIRONMENTAL REGULATION OF CHEMICAL HAZARDS. 3 Hours.**
This course offers an introductory knowledge about regulations and management of environmental and life quality in relation to chemical pollution, waste disposal, energy/resources sustainability, public health threats, and food/consumer product safety. Prerequisite: CHEM 1441 or equivalent.

**EVSE 5314. TOXICOLOGY FOR ENVIRONMENTAL SCIENTISTS. 3 Hours.**
This course offers an introduction to environmental toxicology and methods of measuring and using data on the adverse effects of chemical substances in line with understanding chemical and biochemical phenomena that occur in water, air, terrestrial and living environments, and the impact to human population. Prerequisite: CHEM 1441 or equivalent.

**EVSE 5316. CONSERVATION OF NATURAL RESOURCES. 3 Hours.**
During this course the students will explore natural resources, with special emphasis on new solutions to problems of resource scarcity and conservation. During this course the students will learn about energy, water, air, and food resources conservation. Students will work on developing proposals for addressing water conservation issues. Prerequisite: ENVR 1301, or equivalent, or consult instructor.

**EVSE 5317. ENVIRONMENTAL HYDROLOGY. 3 Hours.**
An introduction to environmental hydrology topics including basic principles of the processes and measurements of precipitation, interception, infiltration, evaporation, evapotranspiration, interflow, overland flow, stream flow, and groundwater flow. Introduction to quantification of watershed metrics such as water budgets, hydrographs, discharge-concentration relationships, and flood routing. Examples and case studies will cover a broad spectrum of modern environmental scenarios (in a changing climate) across urban, agricultural, mining, and natural landscapes and biomes. Prerequisite: MATH 1426, or consent of instructor.

**EVSE 5318. CLIMATE CHANGE RISK AND RESILIENCE. 3 Hours.**
Climate risk is emerging as a key risk driver for systems as diverse as critical infrastructure (e.g. water, energy, transport, communications, buildings, transportation) and the natural environment. These climate risks arising from the physical manifestation of climate change. This course will highlight the roles, responsibilities, and ethical considerations for scientists and engineers and other risk professionals in the identification, evaluation, and management of climate risk, and provide students with a suite of theories, methods, and tools to support risk assessments. Emerging concepts of system resilience will be discussed.

**EVSE 5320. TOXICOLOGY. 3 Hours.**
An introduction to the general principles of toxicology with an emphasis on certain classes of toxic agents, their sources and toxic effects, as well as their environmental fate. Prerequisite: CHEM 2322.

**EVSE 5323. ISSUES IN ENVIRONMENTAL HEALTH. 3 Hours.**
An introduction to health issues of current concern resulting from environmental exposures. Topics include: environmental asthma, endocrine disruptors, climate change and health, emerging contaminants, nanotechnology and health, airborne particles and pediatric health.

**EVSE 5325. TRACER HYDROLOGY. 3 Hours.**
This course is primarily focused on the applications of chemical tracers to study the interaction between precipitation, surface water, and groundwater. The first part covers the basics of water fluxes and naturally occurring and artificial tracers such as stable and radioactive isotopes, noble gases, fluorescent nanoparticles, ions, and DNA. The second part is oriented towards the assimilation of chemical tracer information to enhance hydrological metrics, conceptual model development, and numerical modeling. Prerequisite: ENVR 1301, or GEOL 1301, or cons. inst.

**EVSE 5350. CONTAMINANT HYDROGEOLOGY. 3 Hours.**
Sources and types of various organic and inorganic contaminants; the physical, chemical, and biological factors and processes that affect the transport and fate of contaminants in the subsurface; non-aqueous phase liquids and multiphase flow; and various remedial techniques of contaminated sites. Prerequisite: GEOL 4320 or GEOL 5328 (or concurrent enrollment).

**EVSE 5351. GEOMORPHOLOGY AND QUATERNARY STRATIGRAPHY OF SEDIMENTARY SYSTEMS. 3 Hours.**
This course examines those physical processes that sculpt the surface of the Earth and result in deposition of sediments. Surface systems covered include weathering, mass wasting, rivers, shorelines, eolian processes, and glaciers. The course also examines the stratigraphic techniques used to decode the recent (2 million to present) stratigraphic record of these systems. Course is designed for geologists, biologists, and other fields concerned with interpreting and/or managing modern environments.

**EVSE 5357. MEDICAL GEOLOGY. 3 Hours.**
Introduction to geoscience and health. Students will learn how the geologic and geochemical environment can impact health. The historic background to geoscience and health will be presented followed by discussions on the natural abundance of elements in the earth, and the nature of essential and toxic elements (dose-response). Students will then learn about health responses following exposures in specific geologic/geochemical situations.

**EVSE 5394. INDIVIDUAL PROBLEMS IN ENVIRONMENTAL & EARTH SCIENCES. 3 Hours.**
Individual research projects supervised by a faculty member. Prerequisite: consent of instructor.

**EVSE 5395. MASTER'S PROJECT. 3 Hours.**
May be used as elective for students in non-thesis program. Graded F, P.

**EVSE 5398. THESIS. 3 Hours.**
Graded F, R.

**EVSE 5405. METEOROLOGY AND CLIMATOLOGY. 4 Hours.**
A quantitative approach to the study of the structure, energy, and motions of the atmosphere.

**EVSE 5454. STATISTICS FOR EARTH AND ENVIRONMENTAL SCIENTISTS. 4 Hours.**
This course provides students with basic principles of statistics and helps students apply statistics to analyze data and interpret results from the perspective of Earth and environmental scientists. The course will first introduce basic concepts and then focus on applications to various examples in Earth and environmental sciences. Offered as EVSE 5454 and GEOL 5454. Credit will not be given for both.

**EVSE 5455. MATHEMATICAL MODELING OF ENVIRONMENTAL QUALITY SYSTEMS. 4 Hours.**
This course is designed to introduce the process principles that govern contaminant transport and transformations in multimedia environments. This course will cover application of fate and transport models to evaluate pollutant interactions with the biosphere, particularly in the context of human exposure modeling and health risk assessment. Offered as EVSE 5455 and GEOL 5455. Credit will not be given for both.

**EVSE 5456. ENVIRONMENTAL RISK ASSESSMENT. 4 Hours.**
This course introduces the basic scientific components of environmental and occupational health risk assessment and describes the policy context in which decisions to manage environmental health risks are made. The course presents the quantitative methods used to assess the human health risks associated with exposure to toxic chemicals, focusing on the four major components of risk assessment-hazard identification, dose-response assessment, exposure assessment, and risk characterization. Offered as EVSE 5456 and GEOL 5456, credit will not be given for both.

**EVSE 5457. ENVIRONMENTAL ANALYTICAL CHEMISTRY. 4 Hours.**
This course offers an introduction to chemical and biochemical phenomena that occur in water, air, terrestrial and living environments, and the effects of human activity on them. Environmental chemistry can broaden as much as atmospheric chemistry, aquatic chemistry, chemistry of soil/geosphere, toxicological chemistry and industrial ecology. In this course, mainly chemical substances in diverse environmental compartments and interactions and exposure impact to human and wildlife receptors will be focus based on analytical chemistry principles and perspective. Prerequisite: CHEM 1442 or equivalent courses.

**EVSE 5458. MACHINE LEARNING FOR EARTH AND ENVIRONMENTAL SCIENTISTS. 4 Hours.**
This course provides students with basic principles of machine learning and helps students apply machine learning to analyze data, predict outcomes and interpret results from the perspective of earth and environmental scientists. The course will first introduce basic concepts and then focus on applications to various examples in earth and environmental sciences. Offered as GEOL 5458 and EVSE 5458. Credit will not be given for both. Prerequisite: ENVR 3454 or GEOL 3454 or EVSE 5454 or GEOL 5454 or equivalent.

**EVSE 5465. PHYSICAL OCEANOGRAPHY AND LIMNOLOGY. 4 Hours.**
An introduction to physical processes in lakes and oceans. Changes in lakes and oceans influence heat, and momentum fluxes at the aquatic/oceanic and atmospheric interface. Topics include ocean/lake structure and circulation, and the impact of global climate change on lakes and oceans. Field excursions to nearby lakes combine theoretical knowledge and field measurements. Prerequisite: PHYS 1441 or PHYS 1443; and MATH 1426.

**EVSE 5698. THESIS. 6 Hours.**
Graded F, P, R.

**EVSE 5998. THESIS. 9 Hours.**
Graded F, P, R.

**EVSE 6197. RESEARCH IN ENVIRONMENTAL & EARTH SCIENCES. 1 Hour.**
Individually approved research projects. May be repeated for credit. Graded F, P, R.

**EVSE 6297. RESEARCH IN ENVIRONMENTAL & EARTH SCIENCES. 2 Hours.**
Individually approved research projects. May be repeated for credit. Graded F, P, R.

**EVSE 6397. RESEARCH IN ENVIRONMENTAL AND EARTH SCIENCES. 3 Hours.**
Individually approved research projects. May be repeated for credit. Graded F, P, R.

**EVSE 6399. DISSERTATION. 3 Hours.**
Graded F, R.

**EVSE 6697. RESEARCH IN ENVIRONMENTAL & EARTH SCIENCE. 6 Hours.**
Individually approved research projects. May be repeated for credit. Graded F, P, R.

**EVSE 6699. DISSERTATION. 6 Hours.**
Graded F, R, P, W.

**EVSE 6997. RESEARCH IN ENVIRONMENTAL & EARTH SCIENCE. 9 Hours.**
Individually approved research projects. May be repeated for credit. Graded F, P, R.

**EVSE 6999. DISSERTATION. 9 Hours.**
Graded F, P, R.

**EVSE 7399. DOCTORAL DEGREE COMPLETION. 3 Hours.**
This course may be taken during the semester in which a student expects to complete all requirements for the doctoral degree and graduate. Enrolling in this course meets minimum enrollment requirements for graduation, for holding fellowships awarded by The Office of Graduate Studies and for full-time GTA or GRA positions. Students should verify that enrollment in this course meets other applicable enrollment requirements. To remain eligible in their final semester of study for grants, loans or other forms of financial aid administered by the Financial Aid Office must enroll in a minimum of 5 hours as required by the Office of Financial Aid. Other funding sources may also require more than 3-hours of enrollment. Additional hours may also be required to meet to requirements set by immigration law or by the policies of the student's degree program. Students should contact the Financial Aid Office, other sources of funding, Office of International Education and/or their graduate advisor to verify enrollment requirements before registering for this course. This course may only be taken once and may not be repeated. Students who do not complete all graduation requirements while enrolled in this course must enroll in a minimum of 6 dissertation hours (6699 or 6999) in their graduation term. Graded P/F/R.