



COLUMBIA | ENGINEERING

The Fu Foundation School of Engineering and Applied Science

EARTH AND ENVIRONMENTAL ENGINEERING

M.S.-EEE graduates are specially qualified to work for engineering, financial, and operating companies engaged in mineral processing ventures, the environmental industry, environmental groups in all industries, and for city, state, and federal agencies responsible for the environment and energy/resource conservation. At the present time, the U.S. environmental industry comprises nearly 30,000 big and small businesses with total revenues of more than \$150 billion. Sustainable development and environmental quality has become a top priority of government and industry in the United States and many other nations. For students with a B.S. in engineering, at least 30 points (ten courses) are required. For students with a nonengineering B.S. or a B.A., preferably with a science major, up to 48 points (total of sixteen courses) may be required for makeup courses. Students may carry out a research project and write a thesis worth 3–6 points. A number of areas of study are available for the M.S.-EEE, and students may choose courses that match their interest and career plans. The areas of study include:

- Alternative energy and carbon management
- Climate risk assessment and management
- Environmental health engineering
- Sustainable waste management
- Natural and mineral resource development and management
- Novel technologies: surfacial and colloidal chemistry and nanotechnology
- Urban environments and spatial analysis

M.S. in Earth and Environmental Engineering (M.S.-EEE)

The M.S.-EEE program is designed for engineers and scientists who plan to pursue, or are already engaged in, environmental management/development careers. The focus of the program is the environmentally sound mining and processing of primary materials (minerals, energy, and water) and the recycling or proper disposal of used materials. The program also includes technologies for assessment and remediation of past damage to the environment. Students can choose a pace that allows them to complete the M.S.-EEE requirements while being employed.

Additionally, there are three optional concentrations in the program, in each of which there are a number of required specific core courses and electives. The concentrations are described briefly below; details and the lists of specific courses for each track are available from the department.

EAEE E2100 A better planet by design. 3 points.

CC/GS: Partial Fulfillment of Science Requirement

Lect: 3. Introduction to design for a sustainable planet. Scientific understanding of the challenges. Innovative technologies for water, energy, food, materials provision. Multi-scale modeling and conceptual framework for understanding environmental, resource, human, ecological and economic impacts and design performance evaluation. Focus on the linkages between planetary, regional and urban water, energy, mineral, food, climate, economic and ecological cycles. Solution strategies for developed and developing country settings.

EAEE E3112 Introduction to rock mechanics. 3 points.

Lect: 3. **Not offered during 2019-20 academic year.**

Prerequisites: (EAEE E3101) and (ENME E3111) or equivalent. Rock as an engineering material, geometry and strength of rock joints, geotechnical classification of rock masses, strength and failure of rock, field investigations prior to excavation in rock, rock reinforcement, analysis and support of rock slopes and tunnels, and case histories.

EAEE E3801 Earth and environmental engineering laboratory II. 2 points.

Lect: 1. Lab: 3.

Prerequisites: (EAEE E3800) EAEE E3800

Corequisites: EAEE E4003

A continuation of EAEE E3800, with emphasis on the principles underlying water analysis for inorganic, organic, and bacterial contaminants.

EAEE E3900 Undergraduate research in Earth and environmental engineering. 0 points.

This course may be repeated for credit, but no more than 3 points of this course may be counted towards the satisfaction of the B. S. degree requirements. Candidates for the B.S. degree may conduct an investigation in Earth and Environmental Engineering, or carry out a special project under the supervision of EAEE faculty. Credit for the course is contingent on the submission of an acceptable thesis or final report. This course cannot substitute for the Undergraduate design project (EAEE E3999x or EAEE E3999y)

EAEE E3999 Undergraduate design project. 2 points.

2 pts. (each semester). Lect: 1. Lab: 2.

Prerequisites: Senior standing.

Students must enroll for both 3998x and 3999y during their senior year. Selection of an actual problem in Earth and environmental engineering, and design of an engineering solution including technical, economic, environmental, ethical, health and safety, social issues. Use of software for design, visualization, economic analysis, and report preparation. Students may work in teams. Presentation of results in a formal report and public presentation.

EAEE E4160 Solid and hazardous waste management. 3 points.

Generation, composition, collection, transport, storage and disposal of solid and hazardous waste. Impact on the environment and public health. Government regulations. Recycling and resource recovery.



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UPMANU LALL

ALAN & CAROL SILBERSTEIN PROFESSOR OF EARTH & ENVIRONMENTAL ENGINEERING, AND CIVIL ENGINEERING & ENGINEERING MECHANICS; DIRECTOR COLUMBIA WATER CENTER; CHAIR OF EARTH AND ENVIRONMENTAL ENGINEERING



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CHAIR OF APPLIED PHYSICS AND APPLIED MATHEMATICS AND PROFESSOR OF MATERIALS SCIENCE AND ENGINEERING AND OF EARTH AND ENVIRONMENTAL ENGINEERING



ALAN C. WEST

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FENIOSKY PEÑA-MORA

EDWIN HOWARD ARMSTRONG PROFESSOR OF CIVIL ENGINEERING AND ENGINEERING MECHANICS, PROFESSOR OF EARTH AND ENVIRONMENTAL ENGINEERING, AND PROFESSOR OF COMPUTER SCIENCE



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PROFESSOR OF EARTH AND ENVIRONMENTAL ENGINEERING