

Environmental Engineering

IN THE COLLEGE OF ENGINEERING

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The undergraduate degree in Environmental Engineering is accredited by the Engineering Accreditation Commission (EAC) of ABET, <http://www.abet.org>.

Faculty

Emeritus: Buyuksonmez, Gurol, Stratton
Chair: Supernak

The Blasker Chair in Environmental Engineering: Garoma Ararso

The William E. Leonhard, Jr. Chair in Civil, Construction, and Environmental Engineering: Mladenov

Professors: Garoma Ararso, Supernak

Associate Professor: Mladenov

Assistant Professors: Dykstra, Verbyla

Offered by the Department of Civil, Construction, and Environmental Engineering

Doctor of Philosophy degree in engineering sciences: (bioengineering), (electrical and computer engineering), (mechanical and aerospace engineering), (structural engineering).

Master of Engineering.

Master of Science degree in civil engineering.
Concentration in environmental engineering.

Major in civil engineering with the B.S. degree.

Major in construction engineering with the B.S. degree.

Major in environmental engineering with the B.S. degree.

Mission of the Department

The mission of the Department of Civil, Construction, and Environmental Engineering is to ensure student success by providing a high-quality education through focused instruction, research, and continuing professional development for the benefit of the engineering profession, the environment, and society.

The objective of the program is to give the student a basic knowledge of civil, construction, and environmental engineering, as well as the interdisciplinary background and skills to meaningfully participate in and contribute technical advances toward this profession. The program integrates technical aspects with studies in the social sciences and humanities to ensure appropriate sensitivity to socially related problems.

Instruction is given both at the undergraduate level, leading to the bachelor's degree, and at the graduate level, leading to the master's or doctoral degrees. The undergraduate program builds upon concepts of mathematics, physics, chemistry and basic engineering with specialized study in civil, construction, and environmental engineering. Engineering design is emphasized, particularly in conjunction with computer utilization and practical engineering problems. Aspects of safety and engineering ethics are woven throughout the program. Breadth and depth of social science and humanities studies is assured by department approved courses. Completion of the under-graduate degree prepares the student for an entry-level professional position in addition to informal or formal graduate studies.

Many students who complete the undergraduate programs of the department choose to continue their formal studies on a full- or part-time basis at San Diego State University or at another institution. (See the *Graduate Bulletin* for additional information.)

The civil, construction, and environmental engineering programs are enhanced through cooperation with the American Society of Civil Engineers, the American Public Works Association, the

Associated General Contractors, the Chi Epsilon Civil Engineering Honor Society, and other national organizations who sponsor student chapters to further aid the student's professional development. The chapters at San Diego State University have won many awards in regional and national competition with other schools throughout the country.

Program Educational Objectives

Graduates of the environmental engineering program will (1) be successful engineers in their respective fields of work; (2) be continually progressing in their chosen careers through formal and informal professional development; and (3) be contributing to their profession for the betterment of society and the environment.

The Blasker Chair in Environmental Engineering

The Blasker Chair in Environmental Engineering was established by an endowment from the Blasker-Rose-Miah Endowment Fund of the San Diego Foundation. The fund was created in honor of Mr. Samuel Blasker who left \$8 million to the San Diego Foundation. Mr. Blasker was a successful aeronautical engineer and a businessman with a vision to nurture and develop unique and innovative discoveries and experiences which may be of benefit to humanity.

The current appointee to the Chair, Dr. Temesgen Garoma Ararso, is an accomplished scholar with teaching and research emphasis on renewable energy, resource recovery, and water and wastewater treatment.

The William E. Leonhard, Jr. Chair in Civil, Construction, and Environmental Engineering

The William E. Leonhard, Jr. Chair in Civil, Construction, and Environmental Engineering is funded with an endowment created by generous gifts from William G. Leonhard, Jr. and his parents, William E. and Wyllis M. Leonhard. After Bill Leonhard graduated from San Diego State in 1964, he entered a career in the Air Force, rising to the rank of colonel. In January 1990, he retired from the Air Force, spent the next several years in private industry, and retired again in 1998.

The current chair, Dr. Natalie Mladenov, promotes excellence in undergraduate education, research in environmental engineering, and conducts scholarly activities on the topic of water quality in environmental engineering.

Transfer Credit

No credit will be given for upper division engineering coursework taken at an institution having an engineering program which has not been accredited by the Engineering Accreditation Commission (EAC) of ABET, unless the student successfully completes the first 12 units of engineering work attempted at this university. At that time, and upon recommendation of the department, unaccredited work will be evaluated for full or partial credit.

The Major

Environmental engineering involves the identification and design of solutions for environmental problems. Society's most crucial environmental problems, such as providing safe drinking water, treatment and proper disposal of wastes, water and air pollution control, remediation of sites contaminated with spills or improper disposal of hazardous substances, are handled by environmental engineers. Environmental engineers are technical professionals who possess the scientific knowledge to identify, design, build and operate systems that protect the environment from the impact of human activities, and as such make modern society possible.

The environmental engineering field and environmental engineering education are multidisciplinary. The B.S. degree provides a solid foundation in the fundamentals of mathematics, physics, chemistry, and engineering design that are needed to practice the profession or to pursue a graduate degree. Environmental engineering education also includes a range of other disciplines, such as biology, computer science, ecology, economics, geological sciences, and public health. To be able to address the spectrum of issues facing the environment, environmental engineers are broadly educated, as well as technically trained.

Environmental engineers are needed in both the private and public sectors. They are employed by engineering consulting firms that work in environmental pollution control, industries that need to comply with pollution emission and discharge regulations, private and municipal agencies that supply drinking water, treat and dispose wastes, government agencies that monitor and regulate waste discharges and air emissions, private and government laboratories, and universities that conduct environmental research, international agencies that transfer knowledge to the developing world, and public-interest groups that advocate environmental protection.

Retention Policy

The engineering program expects all majors will make reasonable academic progress toward the degree. Engineering pre-majors who have either (1) completed major preparatory courses, earned 60 units, but have less than a 2.7 cumulative GPA or (2) earned 60 units but have not completed major preparatory courses and/or have less than a 2.7 cumulative GPA may be removed from the premajor and placed in undeclared.

Impacted Program

The environmental engineering major is an impacted program. To be admitted to the environmental engineering major, students must meet the following criteria:

- Complete with a grade of C (2.0) or better: Civil Engineering 225; Chemistry 202 (or 200); Mathematics 150, 151; Physics 195, 196. These courses cannot be taken for credit/no credit (Cr/NC);
- Have an overall cumulative GPA of 2.7.

To complete the major, students must fulfill the degree requirements for the major described in the catalog in effect at the time they are accepted into the premajor at SDSU (assuming continuous enrollment).

Major Academic Plans (MAPs)

Visit <http://www.sdsu.edu/mymap> for the recommended courses needed to fulfill your major requirements. The MAPs website was created to help students navigate the course requirements for their majors and to identify which General Education course will also fulfill a major preparation course requirement.

Environmental Engineering Major

With the B.S. Degree

(Major Code: 09221) (SIMS Code: 442002)

This program requires 127 units to include general education. In addition, the total number of units specified in each elective category represents a minimum requirement.

All students in environmental engineering pursue a common program of study in basic sciences, engineering, and environmental engineering fundamentals and design. The program allows three units of "professional electives" which can be selected from available courses in environmental chemistry, environmental microbiology, water resources, and other areas.

Preparation for the Major. Environmental Engineering 101; Aerospace Engineering 280; Biology 204, 204L; Chemistry 130, 202 (or 200); Civil Engineering 121, 160 (or Statistics 250), 220, 225; Mathematics 150, 151, 252; Physics 195, 195L, 196. (46 units)

Civil Engineering 225; Chemistry 202 (or 200); Mathematics 150, 151; Physics 195, 196 must be completed with a grade of C (2.0) or better. These courses cannot be taken for credit/no credit (Cr/NC).

Graduation Writing Assessment Requirement. Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See "Graduation Requirements" section for a complete listing of requirements.

Major. A minimum of 45 upper division units to include Environmental Engineering 355, 356, 363, 445, 554, 556, 558; Aerospace Engineering 340; Biology 315; Civil Engineering 444, 462, 495; Construction Engineering 330; Mechanical Engineering 350; and three units of professional electives selected from the following: Environmental Engineering 499, 555, Civil Engineering 445, 530, 531, 545, Geography 570, or Geological Sciences 530.

Courses (ENV E)

Refer to *Courses and Curricula and University Policies* sections of this catalog for explanation of the course numbering system, unit or credit hour, prerequisites, and related information.

NOTE: Proof of completion of prerequisites (copy of transcript) is required for all courses which list prerequisites.

LOWER DIVISION COURSES

ENV E 101. Environmental Engineering Seminar (1)

Breadth and depth of environmental engineering field through presentations by invited faculty, graduate students, guests and seminar enrollees; including individual library research with written and oral presentations on selected environmental topics.

ENV E 296. Experimental Topics (1-4)

Selected topics. May be repeated with new content. See *Class Schedule* for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

UPPER DIVISION COURSES

(Intended for Undergraduates)

ENV E 320. Designing Solutions for Environmental Problems (3) [GE]

Prerequisites: Upper division standing and completion of the General Education requirement in Foundations of Learning, II.A. Natural Sciences and Quantitative Reasoning.

Human interaction with the land, water and air environment; environmental pollution; role of engineering in solving environmental problems. Not open to civil or environmental engineering majors.

ENV E 355. Environmental Engineering (3)

Prerequisites: Chemistry 202 (or 200). Approved upper division engineering major, minor, or another major approved by the College of Engineering. **Proof of completion of prerequisites required:** Change of major form or other evidence of acceptable major code.

Causes and effects of environmental problems and engineering methods to control them.

ENV E 356. Environmental Chemistry for Engineers (3)

Prerequisites: Chemistry 130 and Environmental Engineering 355.

Underlying principles of chemistry needed to solve environmental problems and covers the fundamentals of quantitative water and wastewater analysis, to include statistical analysis. Environmental applications in physical, equilibrium, organic, colloidal, and biochemistry concepts.

ENV E 363. Environmental Engineering Laboratory (3)

Two lectures and three hours of laboratory.

Prerequisite: Environmental Engineering 355.

Analysis of natural waters and wastewaters. Sampling and analysis of hazardous environmental pollutants. Techniques to analyze solid waste.

ENV E 445. Water and Wastewater Treatment Systems (3)

Prerequisites: Environmental Engineering 355 and credit or concurrent registration in Civil Engineering 444.

Basic water chemistry, water quality criteria and standards, water usage and distribution. Biological, chemical, and physical processes to treat wastewater. Design of water and wastewater treatment unit processes. Potable and non-potable water reuse. Wastewater collection. Not open to students with credit in Environmental Engineering 441 and 442.

Environmental Engineering

ENV E 496. Advanced Environmental Engineering Topics (1-3)

Prerequisite: Consent of instructor.

Modern developments in environmental engineering. See *Class Schedule* for specific content. Maximum credit six units for any combination of Environmental Engineering 496, 499 and 596.

ENV E 499. Special Study (1-3) Cr/NC

Prerequisite: Consent of instructor.

Individual study in the area of environmental engineering. Maximum credit six units for any combination of Environmental Engineering 496, 499 and 596.

UPPER DIVISION COURSES

(Also Acceptable for Advanced Degrees)

ENV E 554. Process Fundamentals of Environmental Systems (3)

Prerequisites: Environmental Engineering 355 with a grade of C (2.0) or better, Aerospace Engineering 340, Civil Engineering 444, and Mechanical Engineering 350.

Equilibrium and kinetics of chemical and biological reactions of environmental systems. Considerations of mass-transfer and fluid dynamics in water quality management and air pollution control.

ENV E 555. Sustainable Water and Sanitation Systems (3)

Two lectures and two hours of technical activity and laboratory.

Prerequisite: Environmental Engineering 355.

Design and selection of technologies for water delivery, reuse, sanitation, and treatment in developed and developing communities.

ENV E 556. Air Pollution Engineering (3)

Prerequisites: Senior standing and Environmental Engineering 355.

Sources of air pollutants. Transportation, dispersion, and transformation of pollutants in the atmosphere. Measurement and control of air pollution.

ENV E 558. Solid and Hazardous Waste Engineering (3)

Prerequisites: Senior standing and Environmental Engineering 355.

Municipal solid and hazardous solid wastes from an environmental engineering perspective, including waste minimization and recycling. Engineered volume reduction through composting, incineration, mechanical compaction, and other methods. Ultimate disposal, landfill design and legislative regulations.

ENV E 596. Advanced Environmental Engineering Topics (1-3)

Prerequisite: Consent of instructor.

Modern developments in environmental engineering. May be repeated with new content. See *Class Schedule* for specific content. Maximum credit of six units for any combination of Environmental Engineering 496, 499 and 596 applicable to a bachelor's degree. Credit for 596 and 696 applicable to a master's degree with approval of the graduate adviser.

For additional courses which are electives in the environmental engineering program, refer to "Civil Engineering" in this section of the catalog.

GRADUATE COURSES

Refer to the *Graduate Bulletin*.