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# Construction Engineering

In the College of Engineering

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

## Faculty

Chair: Supernak (Interim)  
The AGC Paul S. Roel Chair in Construction Engineering and Management: Supernak (Interim)  
The William E. Leonhard, Jr. Chair in Civil, Construction, and Environmental Engineering: Mladenov  
Professors: Bayasi, Supernak, Walsh  
Associate Professors: Alves, Mitropoulos  
Lecturer: Lakrori

## 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.

## The J.R. Filanc Construction Engineering and Management Program

The J.R. Filanc Construction Engineering and Management Program is supported by an endowment established by a generous gift from Jane E. and Jack R. Filanc in memory of their daughter, Julia L. Filanc, a graduate of San Diego State University. Jack Filanc founded what would become J.R. Filanc Construction Company in 1952. The endowment supports faculty and students in the program, as well as the biannual J.R. Filanc Lecture in Construction Ethics.

J.R. Filanc Construction Company specializes in the construction of water treatment and wastewater treatment plants, pump stations, and other water-related facilities for cities and municipal agencies throughout the Southwest. Functioning as a pure general contractor, the company self-performs 70% of the work on its construction projects.

## The Associated General Contractors (AGC) Paul S. Roel Chair in Construction Engineering and Management

The AGC Paul S. Roel Chair in Construction Engineering and Management is funded with an endowment established by generous gifts from members of the Associated General Contractors in San Diego Chapter. Recognizing the need for expert construction professionals, the local construction community has invested considerable resources in this new degree program. In particular, the endowment is funded by a significant gift from Roel Construction, in honor of Paul S. Roel, the son of the company's founder and the man responsible for moving the family business to San Diego in 1959. Interim Chair, Dr. Janusz C. Supernak, has extensive construction site experience.

## 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.

## Mission of the Department

The mission of the Department of Civil, Construction, and Environmental Engineering is to provide a high quality undergraduate and graduate education in the civil, construction, and environmental engineering areas as well as the advising and other support needed to ensure the students' academic success and preparation for a productive engineering career. In addition, through research and continuing professional development, the faculty produce, enhance and promote new developments within their areas of expertise for the benefit of society and the furtherance of their profession.

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.

## Educational Objectives

The construction engineering program is to reflect a collaborative effort between the construction industry and the university to provide an effective and vigorous workforce development for the continued growth of the San Diego region. Graduates of the construction engineering program will (1) be successful engineers in their respective fields of work; (2) be steadily progressing in their chosen careers through continuous formal and informal professional development; and (3) be on a path to leadership positions within their organizations.

## 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.

## General Education

Students will complete a minimum of 50 units in General Education, to include a minimum of nine upper division units taken after attaining junior class standing. No more than 12 units may be used for General Education credit from any one department or academic unit. No more than 7 units from one department can be used in Sections II and IV combined (Foundations of Learning and Explorations of Human Experience), nor more than 10 units from one department in Sections II, III, and IV combined (Foundations of Learning, American Institutions, and Explorations of Human Experience).

### I. Communication and Critical Thinking: 9 units

You may **not** use Credit/No Credit grades in this section. A grade of C- (1.7) or better is required.

1. Oral Communication (3 units)
2. Composition (3 units)
3. Intermediate Composition and Critical Thinking (3 units)

### II. Foundations of Learning: 29 units

#### A. Natural Sciences and Quantitative Reasoning (17 units):

1. Physical Sciences (11 units)  
Engineering students will take Chemistry 202 (4 units) or Chemistry 200 (5 units).  
Physics 195 (3 units)  
Physics 195L (1 unit)  
Physics 196 (3 units)

2. Life Sciences (3 units)  
Engineering students will take Biology 100 or 101.

3. Laboratory (satisfied under A.1. above)

4. Mathematics/Quantitative Reasoning  
Engineering students will take Mathematics 150, (3 units) applicable to General Education. You may **not** use Credit/No Credit grades in this section. A grade of C- (1.7) or better is required. (NOTE: preparation for the major requires a grade of C (2.0) or better.)

#### B. Social and Behavioral Sciences Construction engineering students will take Economics 102 (3 units)

C. Humanities (9 units)  
Complete three courses in three different areas. One of these courses and the one under IV.A. below must be taken in the same department.  
Construction engineering students will take Philosophy 101 (3 units), Construction Engineering 101 (3 units), and are strongly encouraged to take Spanish 101, 102, 201, 202, 211, 212, 281, or 282.

**III. American Institutions:** Three units of the six units of coursework which meet the American Institutions graduation requirement may be used to satisfy this section, excluding courses numbered 500 and above.

**IV. Explorations of Human Experience: Courses in this area must not be taken sooner than the semester in which you achieve upper division standing (60 units passed). Upper division courses in the major department may not be used to satisfy General Education.**

Total: 9 units; must include one course of cultural diversity.

- A. Upper division Humanities  
Construction engineering students will take Philosophy 332 [or Sustainability 332] (3 units).
- B. Upper division Social and Behavioral Sciences (3 units).
- C. Upper division Social and Behavioral Sciences (Engineering majors may satisfy this area with an additional American Institutions course (excluding 500-level) to complete the American Institutions requirement if this requirement was not completely satisfied with lower division coursework) (3 units).

## The Major

Construction engineering is the application of engineering principles to the human endeavor of construction. The construction engineering major prepares students to undertake careers in the leadership of construction enterprises for all types of construction, including public and private sectors. It also provides an understanding of the interaction between society and the built environment and the ethical issues involved in that interaction.

Construction engineers are needed in both the private and public sectors. They are employed in a range of capacities across the industry, from construction managers, owner's representatives, project engineers, among others. The dynamic and rapid expansion of the regional, national, and global economies and the continued need for housing and other facilities will drive demand for the degree in the foreseeable future.

## Impacted Program

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

- a. Complete with a grade of C (2.0) or better: Aerospace Engineering 200 [or Mechanical Engineering 200]; Chemistry 202 (or 200); Mathematics 150, 151; Physics 195, 196. These courses cannot be taken for credit/no credit (Cr/NC);
- b. 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.

## Construction Engineering Major

**With the B.S. Degree**

**(Major Code: 09254) (SIMS Code: 442010)**

**(SIMS Code: 442011 - Georgia)**

The program below describes 127 units required for the degree. Each course specifically listed in the program is required. In addition, the number of units specified in each elective category represents a minimum requirement.

**Preparation for the Major.** Construction Engineering 101, 201, 280; Accountancy 201; Aerospace Engineering 200 [or Mechanical Engineering 200]; Biology 100 or 101; Chemistry 202 (or 200); Civil Engineering 121, 160 (or Statistics 250), 218, 220; Economics 102; Geological Sciences 100, 101; Mathematics 150, 151; Philosophy 101; Physics 195, 195L, 196. (59 units)

Aerospace Engineering 200 [or Mechanical Engineering 200]; 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).

**General Education.** Engineering students must follow the specific General Education program outlined in this section of the catalog. Other general education requirements and limitations, as well as listings of specific General Education course electives are presented in the General Education section of Graduation Requirements for the Bachelor's Degree.

**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 44 upper division units to include Construction Engineering 301, 312, 320, 330, 340, 401, 479, 480, 590; Civil Engineering 301, 302, 321, 462, 463, 495; and three units selected from the following:

**Technical Electives.** Construction Engineering 520; Civil Engineering 421, 465, 523, 525, 528.

## COURSES (CON 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

#### CON E 101. Construction and Culture (3) [GE]

Cultural context of construction, emphasizing its centrality in evolution and expansion of built environments as expressions of ethical and historical value systems. Relationship between culture, geography, construction materials, and built expressions of cultural legacy. Interdependence of built environment and society.

#### CON E 201. Construction Concepts and Building Codes (3)

Concepts of control and information exchange in construction. Purpose and function of fundamental information flows, function, and development of construction-related codes and standards to protect public health and safety, compliance with requirements, and design using codes.

#### CON E 280. Construction Methods (3)

One lecture and six hours of laboratory. Components and methods of construction including earthwork; foundations; wood, steel, and concrete construction; roofing and cladding; interior construction. Field experience in conducting and/or observing construction operations. Concepts of production in a construction setting.

#### CON 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)

#### CON E 301. Construction Ethics, Law, and Contracts (3)

Prerequisites: Construction Engineering 101, 201, Philosophy 101. Legal and ethical environment of construction. Study of documents and common procedures in construction administration and their legal and ethical contexts for general contractors and subcontractors. Contract documentation, claim in various construction delivery methods.

#### CON E 312. Mechanical and Electrical Principles for Construction (3)

Two lectures and three hours of laboratory. Prerequisites: Mathematics 151 and Physics 196. Engineering principles for mechanical, electrical, plumbing systems. Thermodynamics, energy principles, psychometrics. Electrical theory, circuits, motors. Static and dynamic principles for fluids, pipe flow. Mechanical and plumbing equipment.

#### CON E 320. Construction Estimating (3)

Two lectures and three hours of laboratory. Prerequisites: Construction Engineering 280 and Mathematics 151. Identifying and estimating time and cost requirements for construction operations based on drawings and specifications. Use computer applications for estimating.

#### CON E 330. Principles of Engineering Economy (3)

Prerequisite: Mathematics 151. Mathematics of finance applied to engineering and managerial decision making. Framework for cost management in engineering and construction. (Formerly numbered Construction Engineering 430.)

#### CON E 340. Analysis and Design of Construction Operations (3)

Prerequisites: Construction Engineering 320 and 330. Properties and methods for use of construction equipment and integration into production system. Assessment of equipment needs and selection. Site utilization and layout planning, incorporating efficiency and safety of operations. (Formerly numbered Construction Engineering 310.)

#### CON E 401. Construction Planning and Scheduling (3)

Two lectures and three hours of laboratory. Prerequisites: Civil Engineering 160 and credit or concurrent registration in Construction Engineering 320 for construction engineering majors; Civil Engineering 160 and 321 for civil engineering majors. Fundamentals of scheduling logic including critical path method, deterministic and probabilistic scheduling, and impact of constraints. Development of construction plan and representation in schedule format using common computer applications used in industry.

#### CON E 479. Construction Materials (3)

Two lectures and three hours of laboratory. Prerequisites: Chemistry 202 (or 200) and Civil Engineering 301 (or Mechanical Engineering 304). Selection, design and control of mixes of portland cement and asphalt concrete. Properties of these and other materials used in construction.

#### CON E 480. Design of Temporary Structures (3)

Prerequisites: Civil Engineering 321 and 462. Design of structures for temporary support of constructed work, including scaffolding and formwork, bracing, and excavations. Influence of codes and standards on the design process, selection of degrees of safety, and concepts of liability.

### UPPER DIVISION COURSES (Also Acceptable for Advanced Degrees)

#### CON E 520. Environmentally Conscious Construction (3)

Two lectures and three hours of laboratory. Prerequisite: Construction Engineering 312 for construction engineering majors; Civil Engineering 444 for civil engineering majors; concurrent registration in Civil Engineering 495 for environmental engineering majors.

Design and design processes to target a sustainable structure. Construction practices associated with protection of environment. Application of industry standards for environmental and energy performance of buildings. Impacts on selection of methods, materials, and equipment for construction. Design of procurement and management systems to support environmentally conscious building. Commissioning and startup. (Formerly numbered Construction Engineering 420.)

#### CON E 590. Construction Management and Safety (3)

Prerequisites: Construction Engineering 330 and 401. Management and control of critical project processes for construction projects. Definition, planning, and execution of projects based on plan, estimate, and bid documentation. Fundamentals of construction safety planning, design, and requirements. (Formerly numbered Construction Engineering 490.)

**For additional courses in the construction engineering program, refer to "Civil Engineering" in this section of the catalog.**

### GRADUATE COURSES Refer to the *Graduate Bulletin*.

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