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# Construction Engineering

In the College of Engineering

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## Faculty

Chair: Supernak

The AGC Paul S. Roel Chair in Construction Engineering and Management: Walsh

Professors: Bayasi, Supernak, Walsh

Assistant Professors: Milberg, Serag

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

Doctor of Philosophy degree in engineering sciences/applied mechanics.

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. The first appointee to the Chair, Dr. Kenneth D. Walsh, is an accomplished teacher-scholar, with a research background in improvement of production systems in construction.

## 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 undergraduate 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. The objectives of the construction engineering program are: 1) to provide graduates with the technical knowledge and skills required to practice construction engineering and manage construction projects; 2) to provide graduates with an understanding of the ethical, social, legal, and professional issues faced by the construction industry; and 3) to provide graduates with a solid foundation for graduate studies, continuing education, and lifelong professional development.

## 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 American Board for Engineering and Technology, 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.

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 200 which includes a laboratory (5 units).  
Physics 195 (3 units)  
Physics 196 (3 units)
2. Life Sciences (3 units)
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.

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 in General Education, 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 (3 units).
- B. Upper division Humanities (3 units from a department not selected in A above.)
- C. Upper division Social and Behavioral Sciences

**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.

**Major Academic Plans (MAPs)**

Visit <http://www.sdsu.edu/mymap> for the recommended courses needed to fulfill your major requirements. The MAPs Web site 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)**

The program below describes 130 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; Chemistry 200; Civil Engineering 120, 121, 160, 218; Economics 102; Engineering Mechanics 200; Geological Sciences 100, 101; Mathematics 150, 151; Physics 195, 196. (53 units)

**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 Proficiency Assessment with a score of 10 or above 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, 310, 320, 401, 402, 430, 479, 480, 490; Civil Engineering 301, 302, 321, 462, 463, 495; and three units selected from the following:

**Technical Electives.** Construction Engineering 420; Civil Engineering 421, 465, 523, 525, 528.

**Master Plan.** A master plan of elective courses must be approved by the undergraduate adviser and filed with the Office of Advising and Evaluations as soon as the construction engineering major is declared. Students are required to see their undergraduate adviser prior to registration each semester.

### Courses (CON E)

Refer to *Curricula and Courses* 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.

#### 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 310. Analysis and Design of Construction Operations (3)

Prerequisite: Construction Engineering 280. Properties and methods for use of construction equipment and integration of construction equipment into production system. Assessment of equipment needs and selection. Site utilization and layout planning, incorporating efficiency and safety of operations.

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

Two lectures and three hours of laboratory. Prerequisite: Credit or concurrent registration in Construction Engineering 310. Identifying and estimating time and cost requirements for construction operations based on drawings and specifications. Use computer applications for estimating.

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

Two lectures and three hours of laboratory. Prerequisites: Construction Engineering 320, Civil Engineering 160.

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 402. Mechanical and Electrical Systems (3)

Two lectures and three hours of laboratory. Prerequisites: Construction Engineering 280, 301, Physics 196. Fundamentals of heating, ventilation, electrical circuits, and distribution systems. Simple sizing and balancing operations. Construction principles and practices for mechanical and electrical work. Specialty cost estimation, material handling, and labor analysis. Subcontracts and agreements for specialty construction.

##### CON E 420. Environmentally Conscious Construction (3)

Two lectures and three hours of laboratory. Prerequisite: Construction Engineering 402 for construction engineering majors; Civil Engineering 491 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.

##### CON E 430. 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 Engineering 430.)

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

Two lectures and three hours of laboratory. Prerequisite: Credit or concurrent registration in Civil Engineering 462.

Selection, design and control of mixes of portland cement and asphalt concrete. Properties of these and other materials used in construction. (Formerly numbered Civil Engineering 479.)

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

Prerequisites: Construction Engineering 310, Civil Engineering 301, 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.

##### CON E 490. Construction Project Management and Safety (3)

Prerequisites: Construction Engineering 401, 402. Management and control functions for construction projects. Execution of projects based on plan, estimate and bid documentation. Fundamentals of construction safety planning, design, and requirements.

**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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