CONSTRUCTION MANAGEMENT

College of Engineering and Computer Science

Program Description

The Sacramento State University Construction Management degree prepares students for managerial positions with contractors and other organizations involved in the construction process. For a graduate, this preparation can combine with experience and lead to recognition as a construction professional, a Constructor. The construction professional is responsible for the execution of construction work, for the creation of completed projects from plans prepared by design professionals such as architects and engineers. What is to be built is defined by design professionals; how the work is to be accomplished is the concern of the Constructor. A Constructor determines the methods to be used and directs the economical application of resources in the construction of timely and safe projects at satisfactory prices, and to the required standards of quality.

The immediate objective of the program is to provide university-level preparation for managerial positions in construction and a foundation for continued learning. The curriculum emphasizes subject areas that are significant to the Constructor: engineering fundamentals, construction management, business administration, humanities and social sciences, and the development of analytical and communication skills.

Degree Program

BS in Construction Management with a Minor in Business Administration (http://catalog.csus.edu/colleges/engineering-computer-science/engineering-construction-management/bs-in-construction-management/)

Accreditation

In addition to California State University, Sacramento's full accreditation by the Western Association of Schools and Colleges, the Bachelor of Science in Construction Management is also individually accredited by the American Council for Construction Education.

Notice to Students RE: Professional Licensure and Certification

California State University programs for professions that require licensure or certification are intended to prepare the student for California licensure and certification requirements. Admission into programs for professions that require licensure and certification does not guarantee that students will obtain a license or certificate. Licensure and certification requirements are set by agencies that are not controlled by or affiliated with the California State University and licensure and certification requirements can change at any time.

The California State University has not determined whether its programs meet other states' educational or professional requirements for licensure and certification. Students planning to pursue licensure or certification in other states are responsible for determining whether, if they complete a California State University program, they will meet their state's requirements for licensure or certification. This disclosure is made pursuant to 34 CFR §668.43(a)(5)(v)(C).

Special Features

To meet the objectives of this specialized professional program, the Construction Management curriculum consists of four distinct components:

Engineering: Based in sciences and mathematics, this component stresses engineering principles and their application to the construction process. This component provides sound engineering fundamentals.

Construction Management: This component utilizes the functional approach as a framework for studying the management of the construction process. In the individual courses, construction activities are analyzed from a managerial viewpoint and the functions of management are stressed.

Business Administration Courses: Business courses form the third component and reinforce the program's management emphasis. A minor in Business Administration is obtained by combining the required lower and upper division business courses. Furthermore, completing the minor requirements can satisfy many of the core requirements of the graduate program in Business Administration at Sacramento State.

General Education Courses: The fourth component is critical to the success of construction students who must be sensitive to the issues driving contemporary society.

- This unique program is accredited by the American Council for Construction Education (ACCE).

Academic Policies and Procedures

The following is a summary of policies and procedures specific to the Construction Management program. Other university policies and procedures in this catalog also apply to Construction Management majors. The Department will not hear petitions for deviation from articulated policies made by students who disregard catalog policy.

- Most Construction Management courses require a grade of "C-" or better.
- **Course Repeat Policy:** Undergraduate Construction Management courses that are used to meet the degree requirements for the Bachelor of Science degree in Construction Management may be repeated only twice (for a total of three attempts). Grades of the second and third attempt will be averaged in grade point calculations.

Career Possibilities

Construction Manager · General Contractor · Sub-Contractor · Project Manager · Construction Estimator · Technical Salesperson · Construction Scheduler or Planner · Forensic Construction Specialist · Environmental Remediation Contractor · Construction Consultant

Contact Information

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Faculty

ANDERSON, MIKAEL

FIGGESS, GARETH

HANSEN, KAREN L.

MANTELL, ANDY

SALAMA, TAREK

CM 9. Construction Surveying and Layout. 3 Units
Prerequisite(s): CM 10, CM 20, CM 21 and either Math 26A or MATH 30 ; CM 21 and Math 26A or MATH 30 may be taken concurrently.
Corequisite(s): CM 21.
Term Typically Offered: Fall, Spring

Geomatics and the principles of surveying measurements for distance, direction, and elevation. Special emphasis on the application of surveying skills relevant to the field of construction, including building, bridge, and sitework layout techniques and procedures, establishment of reference line and grade, topographic mapping, and earthwork computations. Lecture two hours. Laboratory 3 hours.

CM 10. The Construction Industry. 1 Unit
Term Typically Offered: Fall, Spring

Introduction to the Construction Management program and the many facets of the construction industry and to the various career opportunities. The unique products of construction, the organizations involved, and the people that make it happen. Guest speakers. Lecture one hour.
Credit/No Credit

CM 15. Fundamentals of Construction Management. 3 Units
Prerequisite(s): CM 10. CM 10 may be taken concurrently.
Term Typically Offered: Fall, Spring

Introduction to the Construction Management program and industry. Critical reading, thinking and writing for the construction profession. Introduction to visualization and graphic communication using both manual and computer assisted techniques. Introduction to quantitative software commonly used in the construction industry.

CM 20. Construction Materials and Processes. 3 Units
Prerequisite(s): CM 10, ENGL 1A; CM 10 may be taken concurrently.
Term Typically Offered: Spring only

Introduction to construction materials; to their properties in-place in completed projects, and to their characteristics that affect construction processes. The organizations, methods, equipment and safety considerations that are common to projects of all types and to all segments of the industry. Field trips. Lecture two hours; laboratory three hours.
Field trip(s) may be required.

CM 21. Construction Graphics. 3 Units
Prerequisite(s): ENGL 1A and CM 10; CM 10 may be taken concurrently.
Term Typically Offered: Fall only

Instruction and exercises in graphic techniques and procedures applicable to construction. Analysis of drawings in the civil, architectural, structural, mechanical, and electrical fields and how drawings affect construction planning. Freehand sketching. Isometric and oblique projections. Material quantity surveying. Lecture two hours; laboratory three hours.

CM 22. Construction Documents. 3 Units
Prerequisite(s): ENGL 1A, CM 20, and CM 21; CM 20 may be taken concurrently.
Term Typically Offered: Spring only

Analyzes construction contract documents. Technical and legal interpretations and implications to managers of the construction process. Quantity surveying. Lecture two hours; laboratory three hours.

CM 30. Engineering Mechanics--Statics. 3 Units
Prerequisite(s): MATH 26A or MATH 30; and PHYS 5A or PHYS 11A.
Term Typically Offered: Spring only

Introduction to the solution of engineering design problems. Concepts of units, vectors, equilibrium, forces, force systems, shear and moment diagrams. Lecture three hours.

CM 40. Properties of Construction Materials. 3 Units
Prerequisite(s): PHYS 5A.
Term Typically Offered: Fall only

Study of the engineering performance characteristics of materials. Covers testing concepts and procedures. Includes basic properties of metals, aggregates, cements, concrete, timber, asphalt, masonry and plastics with emphasis on construction applications. Lecture two hours; laboratory three hours.

CM 96C. Residential Construction Study Abroad. 3 Units
Term Typically Offered: Summer only

This course introduces wood products, wood processing, materials, methods, and techniques associated with wood frame residential construction. Students will gain an understanding of how to use hand and power tools as well as safety hazards associated with residential construction. Students learn how to develop a construction project plan, schedule, and cost estimate for a residential construction project and how to apply these concepts in the workplace. Students will spend 10 days abroad building a home as part of the course.
Note: This course requires safety training and personal protective equipment (PPE).

CM 110. Legal Aspects of Construction. 3 Units
Prerequisite(s): Senior class standing, MGMT 101, CM 22.
Corequisite(s): CM 126
Term Typically Offered: Fall only

Application of advanced legal concepts to the construction process. Analyzes problems relating to contract formation, administration, and interpretation. Includes bidding and contract enforcement; litigation of disputes vs. arbitration; liability for negligence, warranty, and strict liability; safety; license law requirements; mechanics' liens and stop notices; bond rights and obligations. Lecture three hours.

CM 111. Construction Labor Relations. 3 Units
Term Typically Offered: Spring only

Study of federal and state labor law; labor unions, and their importance in the construction industry; and an analysis of the growth of open-shop construction. Employment law. Lecture three hours.

CM 120. Construction Operations and Methods Analysis. 3 Units
Prerequisite(s): CM 22.
Corequisite(s): CM 121.
Term Typically Offered: Fall only

Introduction to the analysis and management of construction projects in terms of the work that must be performed in the construction process. Analyzes operations and methods using concepts and techniques, including video, that are applicable to all types of projects in all segments of the industry, variables affecting productivity. Safety as an integral part of project and operations management. Field trips. Lecture two hours; laboratory three hours.
Field trip(s) may be required.

CM 121. Fundamentals of Construction Estimating. 3 Units
Prerequisite(s): CM 22.
Corequisite(s): CM 120.
Term Typically Offered: Fall only

Study of the basic approaches to estimating the cost of construction projects from a managerial viewpoint. Types of estimates and methods; elements of cost, variables and costing concepts; analysis procedures for detailed estimates. Lecture two hours; laboratory three hours.

CM 124. Engineering Construction. 3 Units
Prerequisite(s): CM 125, CM 135.
Term Typically Offered: Fall only

Study of engineering construction projects with emphasis on equipment-paced operations including safety aspects. Engineering fundamentals and other factors that affect equipment selection and production. Amplification of recording and analysis techniques. Unit price contracts. Field trips. Lecture two hours; laboratory three hours.
Field trip(s) may be required.

CM 125. Advanced Estimating and Bidding. 3 Units
Prerequisite(s): CM 120, CM 121.
Term Typically Offered: Spring only

Study of the concepts and practices involved in the total estimating and bidding process in construction, from initial project selection to submission of final bids. Covers considerations in project selection, sub-bid analysis, contingency and risk analysis, pricing concepts, bidding models, and an introduction to computer applications. A complete project estimate and bid is prepared by each student. Lecture two hours; laboratory three hours.

CM 126. Construction Project Management. 3 Units
Prerequisite(s): CM 125, CM 127.
Corequisite(s): CM 110.
Term Typically Offered: Fall only

Introduction to the study of Project Management as it is used on the larger construction project. Students study how construction contractors manage cost, time, scope, and quality. The theory of Project Management is developed and compared to management of the on-going business enterprise. Matrix and functional organizations are examined within the context of the industrial, commercial and heavy contract construction industries using the principles of the management process. Lecture three hours.

CM 127. Planning, Scheduling and Control. 3 Units
Prerequisite(s): CM 121.
Term Typically Offered: Spring only

Study of the concepts used in planning and controlling construction projects. Arrow, PERT, precedence, and linear scheduling methods; resource leveling; time-cost analysis; bar charts; and time-scaled diagrams. Manual procedures followed by computer applications. Lecture three hours.

CM 129. Senior Project. 3 Units
Prerequisite(s): CM 110, CM 111, CM 124, CM 126, HROB 101.
Term Typically Offered: Spring only

Consideration of technical, legal, business and human factors (including safety) in applying the functional approach to the management of construction organizations, projects, and operations. The individual construction professional in a competitive industry: personal and professional development, ethics, stress, physical and mental health. The industry and the construction professional in relation to the social and physical environments. Lecture three hours.

CM 130. Structures I -- Design Principles and Structural Steel Design. 3 Units
Prerequisite(s): CM 30, CM 40; CM 40 may be taken concurrently.
Term Typically Offered: Fall only

Introduction to structural design. Consideration of load conditions, stresses, strain, beam deflection and column action. Basic design of structural steel members with emphasis on systems used in practical situations. Beams, trusses, and columns are designed using the Uniform Building Code as a reference and the results are shown on detailed drawings and sketches. Lecture three hours.

CM 135. Soils and Foundations. 3 Units
Prerequisite(s): CM 130.
General Education Area/Graduation Requirement: Upper Division Further Studies in Area B5
Term Typically Offered: Fall only

Quantitative analysis of the properties and behaviors of soils used as materials in construction. Index and physical properties of soils including compaction; permeability, compressibility, and shear strength. Methods of laboratory and field tests. Principles of foundation design, pavements, embankments and temporary soil support systems for trenches and cuts. Lecture two hours; laboratory three hours.
Note: This course requires safety training this; course requires personal protective equipment (PPE).

CM 136. Principles of Mechanical and Electrical Engineering. 3 Units
Prerequisite(s): PHYS 5B, CM 30.
Term Typically Offered: Fall only

Basic principles of thermodynamics with application to heating, ventilating and air conditioning systems. Introduction to electrical circuits and circuit analysis with construction applications. Lecture three hours.

CM 140. Structures II -- Timber and Formwork Design. 3 Units
Prerequisite(s): CM 130.
Term Typically Offered: Spring only

Basic design of structural timber members with emphasis on systems used in practical situations. Beams, trusses, and columns are designed using the Uniform Building Code as a reference and the results are shown on detailed drawings and sketches. Application of engineering principles to satisfy construction requirements that are not designed or shown in typical construction documents. Includes analysis and design of concrete form systems, shoring, and falsework, and construction dewatering. Lecture three hours.

CM 150. Structures III -- Reinforced Concrete and Reinforced Masonry. 3 Units
Prerequisite(s): CM 130.
Term Typically Offered: Fall only

Basic design concepts of reinforced concrete and reinforced masonry design. Topics and examples include design of beams, slabs, columns and walls. Students are required to demonstrate drafting ability. Assignments include design and drawings of various structural systems. Lecture three hours.

CM 196D. Virtual Design and Construction. 3 Units
Prerequisite(s): CM 125 & CM127
Term Typically Offered: Fall, Spring

This course consists of instructions and exercises in virtual design applications in construction. Students will learn to develop 2D CAD drawings, 3D building information models (BIM), 4D BIM models to link the 3D model with construction schedules, and 5D models to link the 4D model with construction cost. Students will also learn to visualize an augmented reality BIM model for construction using 3D goggles (Microsoft HoloLens 2), and to utilize 3D laser scanning in capturing the details of an existing.

CM 199. Special Problems. 1 - 3 Units
Term Typically Offered: Fall, Spring

Individual projects or directed reading.
Note: Open only to students competent to carry on individual work. Admission to this course requires approval of an instructor and the program coordinator.

Credit/No Credit

CM 296A. Sustainable Design and Construction. 3 Units
Prerequisite(s): Graduate standing or instructor permission.
Term Typically Offered: Fall only – even years

Provides a foundation in sustainable building concepts and design principles while giving students the opportunity to practice applying these principles to actual projects. Prepare the new generation of engineers to address complex societal problems and develop the vocabulary and skills to become proactive contributors to sustainable design and construction project teams. This course will be offered experimentally.

CM 296B. Advanced Construction Safety Management. 3 Units
Prerequisite(s): CM 120 or Graduate standing.
Term Typically Offered: Fall only – even years

The Advanced Construction Safety Management course is designed to provide students with an in-depth understanding of the principles, strategies, techniques, and technology used to manage safety in the construction industry and examine its complexity. This course explores emerging safety management techniques and technologies with a particular emphasis on subjects including human error and safety behavior, safety risk analysis and management, and advanced techniques to identify and evaluate construction-specific hazards.
Note: This course requires safety training and personal protective equipment (PPE).

CM 296C. Automation in Construction. 3 Units
Prerequisite(s): CM 196D or graduate standing.
Term Typically Offered: Fall, Spring

Provides an in-depth exploration of the rapidly evolving automation technologies in the construction industry (i.e., Construction 4.0). Equips students with the knowledge and skills necessary to leverage automation to optimize construction processes, enhance productivity through innovative methodologies, emerging technologies, case studies, and hands-on exercises. Focuses on the application of digital technologies such as BIM, cloud-based project management, visual and virtual progress monitoring, 3D printing and digital fabrication, UAVs, robotics, sensors, LiDAR systems, and photogrammetry in the construction industry.