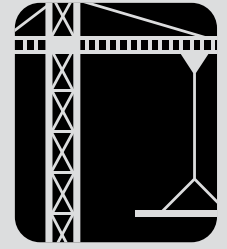


Engineering – Construction Management

College of Engineering and Computer Science



Bachelor of Science • Minor

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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.

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

Faculty

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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 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.

Requirements • Bachelor of Science Degree • Minor in Business Administration

Units required for Lower Division Premajor: 33

Units required for Upper Division Major: 42

Units required for Business Minor: 24

Minimum total units for the BS: 132

Note: Additional units may be required to meet the Sacramento State foreign language requirement.

Courses in parentheses are prerequisites.

A. Required Lower Division Courses (Pre-major)

First Semester Freshman Year - Fall (16 units)

- (3) CE 9 Plane and Topographic Surveying (MATH 26A or MATH 30; may be taken concurrently)
- (1) CM 10 The Construction Industry
- (3) ECON 1A* Introduction to Macroeconomic Analysis **OR**
ECON 1B* Introduction to Microeconomic Analysis
- (3) ENGL 1A* College Composition (EPT score of 149 or above, or completion of ENGL 1)
- (3) MATH 26A* Calculus I for the Social and Life Sciences (MATH 11 or three years of high school mathematics which includes two years of algebra and one year of geometry; completion of ELM requirement and the Intermediate Algebra Diagnostic Test) **OR**
MATH 30* Calculus I (MATH 29 or four years of high school mathematics which includes two years of algebra, one year of geometry, and one year of mathematical analysis; completion of ELM requirement and Pre-Calculus Diagnostic Test)
- (3) General Education Course

Second Semester Freshman Year - Spring (16 units)

- (3) ACCY 1 Accounting Fundamentals (Entry Level Math (ELM) test of at least 36 or a CR grade in LS 7A)
- (3) CM 20 Construction Materials and Processes (CM 10 and ENGL 1A)
- (3) ENGL 20* College Composition II (ENGL 1A with a grade of "C-" or better, or equivalent) **OR**
ENGL 20T* College Composition II – Technical Communications (ENGL 1A with a grade of "C-" or better, or equivalent)
- (3) MATH 26B* Calculus II for the Social and Life Sciences (MATH 26A or appropriate high school based AP credit) **OR**
MATH 31* Calculus II (MATH 30 or appropriate high school based AP credit)
- (4) PHYS 5A* General Physics: Mechanics, Heat, Sound (Recently completed three years of high school algebra and geometry; and a college course in algebra and trigonometry [MATH 9 recommended] for those having an inadequate mathematics background)

First Semester Sophomore Year - Fall (16 units)

- (3) ACCY 2* Managerial Accounting (ACCY 1)
- (3) CM 21 Construction Graphics (CM 20, competence in mechanical drawing)
- (3) CM 40 Properties of Construction Materials (PHYS 5A)
- (4) PHYS 5B* General Physics: Light, Electricity and Magnetism, Modern Physics (PHYS 5A or instructor permission)
- (3) General Education Course

Second Semester Sophomore Year - Spring (18 units)

- (3) CM 22 Construction Documents (CM 21)
- (3) CM 30 Engineering Mechanics – Statics (CM 21, MATH 26B, PHYS 5A; MATH 26B may be taken concurrently)
- (3) COMS 4* Introduction to Public Speaking **OR**
COMS 5* The Communication Experience
- (3) ENV 10* Environmental Science
- (3) STAT 1* Introduction to Statistics (MATH 9 or three years of high school mathematics which includes two years of algebra and one year of geometry; completion of ELM requirement and the Intermediate Algebra Diagnostic Test)
- (3) General Education Course

*Indicates courses that can also be used to satisfy General Education requirements. For the degree, students must satisfy all the University's General Education requirements for Construction Management. Students should contact the program office for a complete list of these requirements. A second year foreign language course (2A or equivalent) may also satisfy 3 units of GE when the course is being taken to comply with the Sacramento State foreign language requirement. Students should consult with an advisor for exact GE eligibility of these courses.

Notes:

- High school chemistry (one year), mechanical drawing (one year), and trigonometry (one-half year) also required. Students without this high school preparation must take the necessary courses in addition to those listed above.
- The recommended course sequence may change. Students should consult the Construction Management program for current information.

Computer Literacy and Competency

All majors and pre-majors shall demonstrate computer literacy and competency prior to taking 100-level construction management or business courses. This requirement is met by passing scores on examinations as administered by the College of Business Administration in each of the following areas:

- Elements of microcomputer hardware and systems software for PC compatible computers, and use of internet browsers (covered in MIS 1).
- Basic facility with spreadsheets using the College of Business Administration's standard spreadsheet package (covered in MIS 2).
- Word processing and presentation graphics (covered in MIS 3).

B. Required Upper Division Courses (Major)

Upper division Construction Management courses are open only to students who have satisfactorily completed all required lower division preparation and have been admitted to the major. Lower division prerequisites are noted below only to show the relationship of the subjects.

First Semester Junior Year - Fall (18 units)

- (3) CM 120 Construction Operations and Methods Analysis (CM 22; Corequisite: CM 121)
- (3) CM 121 Fundamentals of Construction Estimating (CM 22; Corequisite: CM 120)
- (3) CM 130 Structures I - Design Principles and Structural Steel Design (CM 30, and CM 40; CM 40 may be taken concurrently)
- (3) CM 136 Principles of Mechanical and Electrical Engineering (PHYS 5B, CM 30)
- (3) MGMT 101 Legal Environment of Business
- (3) MGMT 117* Business, Ethics, and Society (Passing score on WPE)

Second Semester Junior Year - Spring (15 units)

- (3) CM 111 Construction Labor Relations
- (3) CM 125 Advanced Estimating and Bidding (CM 120, CM 121)
- (3) CM 127 Planning, Scheduling and Control (CM 121)
- (3) CM 135 Soils and Foundations (CM 130)
- (3) CM 140 Structures II - Timber and Formwork Design (CM 130)

First Semester Senior Year - Fall (18 units)

- (3) CM 110 Legal Aspects of Construction (MGMT 101 , CM 22)
- (3) CM 124 Engineering Construction (CM 125, CM 135)
- (3) CM 126 Construction Project Management (CM 125, CM 127)
- (3) CM 150 Structures III - Concrete and Masonry (CM 140)
- (3) HROB 101 The Management of Contemporary Organizations
- (3) General Education Course

Second Semester Senior Year - Spring (15 units)

- (3) BA Elective A 100-level Business Administration course
- (3) CM 129* Construction Management (CM 110, CM 111, CM 126, HROB 101)
- (3) Select one of the following:
 - FIN 101 Business Finance
 - MKTG 101 Principles of Marketing
 - OPM 101 Operations Management (DS 101 and instructor permission)
- (3) General Education Course
- (3) General Education Course

*Indicates courses that also can be used to satisfy General Education requirements. For the degree, students must satisfy all the University's General Education requirements for Construction Management. Students should contact the program office for a complete list of these requirements.

Note: Business Administration lower and upper division courses apply both to the major and to a Business Administration minor. Students interested in pursuing a pre-MBA sequence should contact the Degree Program Center in the College of Business Administration.

Lower Division Courses

CM 10. The Construction Industry. 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. **Units:** 1.0.

CM 20. Construction Materials and Processes. 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. **Prerequisite:** CM 10, ENGL 1A. **Units:** 3.0.

CM 21. Construction Graphics. 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. **Prerequisite:** CM 20, competence in mechanical drawing. **Units:** 3.0.

CM 22. Construction Documents. Analyzes construction contract documents. Technical and legal interpretations and implications to managers of the construction process. Quantity surveying. Lecture two hours; laboratory three hours. **Prerequisite:** CM 21. **Units:** 3.0.

CM 30. Engineering Mechanics—Statics. Introduction to the solution of engineering design problems. Concepts of units, vectors, equilibrium, forces, force systems, shear and moment diagrams. Lecture three hours. **Prerequisite:** CM 21, MATH 26B, PHYS 5A; MATH 26B may be taken concurrently. **Units:** 3.0.

CM 40. Properties of Construction Materials. 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. **Prerequisite:** PHYS 5A. **Units:** 3.0.

Upper Division Courses

CM 110. Legal Aspects of Construction. 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. **Prerequisite:** Senior class standing, MGMT 101, CM 22. **Corequisite:** CM 126 **Units:** 3.0.

CM 111. Construction Labor Relations. 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. **Units:** 3.0.

CM 120. Construction Operations and Methods Analysis. 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. **Prerequisite:** CM 22. **Units:** 3.0.

CM 121. Fundamentals of Construction Estimating. 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. **Prerequisite:** CM 22. **Corequisite:** CM 120. **Units:** 3.0.

CM 124. Engineering Construction. 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. **Prerequisite:** CM 125, CM 135. **Units:** 3.0.

CM 125. Advanced Estimating and Bidding. 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. **Prerequisite:** CM 120, CM 121. **Units:** 3.0.

CM 126. Construction Project Management. 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. **Prerequisite:** CM 125, CM 127. **Units:** 3.0.

CM 127. Planning, Scheduling and Control. 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. **Prerequisite:** CM 121. **Units:** 3.0.

CM 129. Construction Management. 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. **Prerequisite:** CM 110, CM 111, CM 126, HROB 101. **Units:** 3.0.

CM 130. Structures I – Design Principles and Structural Steel Design. 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. **Prerequisite:** CM 30, CM 40; CM 40 may be taken concurrently. **Units:** 3.0.

CM 135. Soils and Foundations. Study 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. **Prerequisite:** CM 130. **Units:** 3.0.

CM 136. Principles of Mechanical and Electrical Engineering. 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. **Prerequisite:** PHYS 5B, CM 30. **Units:** 3.0.

CM 140. Structures II – Timber and Formwork Design. 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. **Prerequisite:** CM 130. **Units:** 3.0.

CM 150. Structures III – Concrete and Masonry. 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. **Prerequisite:** CM 140. **Units:** 3.0.

CM 199. Special Problems. 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. **Graded:** Graded (CR/NC Available). **Units:** 1.0-3.0.