



ENGINEERING TECHNOLOGY— CONSTRUCTION MANAGEMENT

BACHELOR OF SCIENCE

PROGRAM DESCRIPTION

The CSUS 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 is master of the construction process; that is, master of the process that involves determining the methods to be used, and directing 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. Qualified students may pursue special academic plans in mechanical and electrical contracting, and environmental remediation.

FACULTY

Keith Bisharat, *Director*

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FEATURES

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

The **engineering component**, based in sciences and mathematics, stresses engineering principles and their application to the construction process. This component provides sound engineering fundamentals that has enabled graduates to take and pass the Engineer-in-Training examination.

The **construction management** 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.

Courses in **business administration**, the supporting field, 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 CSUS.

Overall, the curriculum provides the balanced content that is essential to construction professionals. This unique program is fully accredited by both the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) and the American Council for Construction Education (ACCE).

CAREER POSSIBILITIES

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

MAJOR REQUIREMENTS • BS

Total units required for BS: 140

Total units required for Major: 59 upper division

Total units required for Pre-major: 59 lower division

Courses in parentheses are prerequisites.

A. Required Lower Division Courses (Pre-major)

1. First Semester Freshman Year (18 units)

- (4) BIO 5* General Biology
- (1) CM 10 The Construction Industry
- (3) CM 20 Construction Materials & Processes
- (3) MATH 26A Calculus I **OR**
MATH 30* Calculus I
- (4) PHYS 5A* General Physics: Mechanics, Heat,
Sound
- (3) General Education Course

2. Second Semester Freshman Year (16 units)

- (3) CM 21 Construction Graphics (CM 20,
mechanical drawing ability)
- (3) MATH 26B Calculus II (MATH 26A) **OR**
MATH 31* Calculus II
- (3) MIS 5 Introduction to Management
Information Systems
- (3) OBE 18 Business Law
- (4) PHYS 5B* General Phys: Light, Electricity &
Magnetism, Modern Physics (PHYS
5A)

3. First Semester Sophomore Year (16 units)

- (3) ACCY 1 Accounting Fundamentals
- (4) CE 9 Plane & Topographic Surveying
(MATH 30 or equivalent)
- (3) CM 22 Construction Documents (CM 10,
CM 21, OBE 18)
- (3) CM 40 Properties of Construction Materials
(CM 20, PHYS 5A)
- (3) ENGL 1A* Introduction to College Composition

4. Second Semester Sophomore Year (18 units)

- (3) ACCY 2 Managerial Accounting (ACCY 1)
- (3) CM 30 Engineering Mechanics—Statics
(MATH 26B, PHYS 5A)
- (3) COMS 4* Introduction to Public Speaking **OR**
COMS 5* The Communication Experience
- (3) STAT 1* Introduction to Statistics
- (3) ENGL 20 Expository Writing (ENGL 1A)
- (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 CSUS foreign language requirement. Students should consult with an advisor for exact GE eligibility of these courses.

Note: 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.

B. Required Upper Division Courses (Major)

Upper division CM 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.

1. First Semester Junior Year (18 units)

- (3) CM 110 Legal Aspects of Construction (OBE 18)
- (3) CM 120 Construction Operations &
Methods Analysis (CM 22)
- (3) CM 121 Fundamentals of Construction
Estimating (CM 22; CM 120
concurrently)
- (3) CM 130 Structures I-Design Principles &
Structural Steel Design (CM 30)
- (3) OBE 130 Business Communications
- (3) General Education Course

2. Second Semester Junior Year (18 units)

- (3) CM 111 Construction Labor Relations
- (3) CM 125 Advanced Estimating & Bidding
(CM 121)
- (3) CM 127 Planning, Scheduling & Control
(CM 121)
- (3) CM 135 Soils & Foundations (CM 130)
- (3) CM 140 Structures II-Timber & Formwork
Design (CM 130)
- (3) ECON 1A or 1B

3. First Semester Senior Year (18 units)

- (3) CM 126 Construction Project Management
(CM 125, 127)
- (3) CM 124 Engineering Construction (CM 120,
135)
- (3) CM 150 Structures III - Concrete & Masonry
(CM 140)
- (3) OBE 150 The Management of Contemporary
Organizations
- (3) Select one of the following:
MGMT 120 Principles of Marketing
MGMT 133 Business Finance
MGMT 180 Production & Operations Manage-
ment
- (3) General Education Course

4. Second Semester Senior Year (18 units)

- (3) CM 129* Construction Management (CM
110, 111, 124, 126, 127, OBE 150)
- (3) CM 136 Principles of Mechanical &
Electrical Engineering (PHYS 5B,
CM 30)
- (3) BA Elective A 100-level Business Administra-
tion course
- (3) General Education Course
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Mechanical-Electrical Elective Sequence

For a limited number of students who specifically plan careers in mechanical or electrical contracting, it is possible to arrange a different sequence of courses in the engineering fundamentals component. Subject to space being available in the MET courses, and subject to approval by both departments of a specific plan, courses selected from the MET 110, 140 and 150 series can be substituted for the five courses in the CM 130 series.

Cooperative Education

Students are encouraged to participate in the Cooperative Education Program which provides alternate periods of study at the University and practical work experience in industry or government for pay. Most participants of the Co-op plan will complete one six-month work period in their junior year and the other in their senior year. Academic credit is granted for successful completion of the Co-op phase. Applications for the program are available from the Cooperative Education Program office in the Engineering Building, room 1204.

BUSINESS MINOR

Listed upper and lower division Business Administration 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 School of Business Administration.

LOWER DIVISION COURSES

10. The Construction Industry. An introduction to 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. Spring only. 1 unit.

20. Construction Materials and Processes. An 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. Spring only. 3 units.

21. Construction Graphics. Instruction and exercises in graphic techniques and procedures applicable to construction. The preparation of conventional drawings in the civil, architectural, structural, mechanical and electrical fields. Freehand sketching. Isometric and perspective presentations. Computer-aided drafting. Laboratory nine hours. **Prerequisites:** CM 20, competence in mechanical drawing. Fall only. 3 units.

22. Construction Documents. Analysis of construction drawings, specifications, bid and contract documents. Technical and legal interpretations and implications to managers of the construction process. Quantity surveying. Lecture two hours, laboratory three hours. **Prerequisites:** CM 10, 21, OBE 18. 3 units.

30. Engineering Mechanics—Statics. An introduction to the solution of engineering design problems. Concepts of units, vectors, equilibrium, forces, force systems, shear and moment diagrams. Lecture three hours. **Prerequisites:** MATH 26B, PHYS 5A; MATH 26B may be taken concurrently. 3 units.

40. Properties of Construction Materials. A 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. **Prerequisites:** CM 20, PHYS 5A. 3 units.

UPPER DIVISION COURSES

110. Legal Aspects of Construction. The application of basic legal concepts to the construction process. Analysis of problems relating to contract formation, administration, and interpretation. Includes bidding and contract enforcement; litigation of disputes vs arbitration; liability for negligence, warranty, or strict liability; safety; license law requirements; mechanics' liens and stop notices; bond rights and obligations. Lecture three hours. **Prerequisite:** OBE 18. Spring only. 3 units.

111. Construction Labor Relations. A 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. Lecture three hours. Fall only. 3 units.

120. Construction Operations and Methods Analysis. An introduction to the analysis and management of construction projects in terms of the work that must be performed in the construction process. Analysis of operations and methods using concepts and techniques, including time lapse photography, that are applicable to all types of projects in all segments of the industry. Safety as an integral part of project and operations management. Field trips. Lecture two hours, laboratory three hours. **Prerequisite:** CM 22. Spring only. 3 units.

121. Fundamentals of Construction Estimating. A study of the basic approaches to estimating the cost of all types 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. Spring only. 3 units.

124. Engineering Construction. A 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. **Prerequisites:** CM 120, 135. Fall only. 3 units.

125. Advanced Estimating and Bidding. A 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, variables affecting labor productivity, 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 121. Fall only. 3 units.

126. Construction Project Management. An introductory class in the study of Project Management as it is used on the larger construction project. Students study how construction general 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. **Prerequisites:** CM 125, 127. Spring only. 3 units.

127. Planning, Scheduling and Control. A 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. Spring only. 3 units.

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. **Prerequisites:** CM 110, 111, 126, 127, OBE 150. Fall only. 3 units.

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. Spring only. 3 units.

135. Soils and Foundations. A 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 design of foundations, pavements, embankments and temporary soil support systems for trenches and cuts. Lecture two hours, laboratory three hours. **Prerequisite:** CM 130. Fall only. 3 units.

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. **Prerequisites:** PHYS 5B, CM 30. Fall only. 3 units.

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. Fall only. 3 units.

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. Spring only. 3 units.

195. Fieldwork in Construction Management. Supervised work experience in a professional construction management environment with public agencies or firms in the industry. **Prerequisite:** approval of petition by the supervising faculty member and department chair. May be repeated for credit. Graded Credit/No Credit. 1-3 units.

195A-D. Fieldwork in Construction Management. Supervised employment in a professional construction management environment. Placement arranged through the School of Engineering and Computer Science. Course requires satisfactory completion of the work assignment and a written report. **Prerequisite:** permission of instructor. Graded Credit/No Credit. 1-12 units.

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 student's advisor. 1-3 units.